Aug. 30, 1966 D. E. JOSLYN 3,269,478

STAIR CLIMBING WHEEL CHAIR

Filed Dec. 6, 1965

2 Sheets-Sheet 1

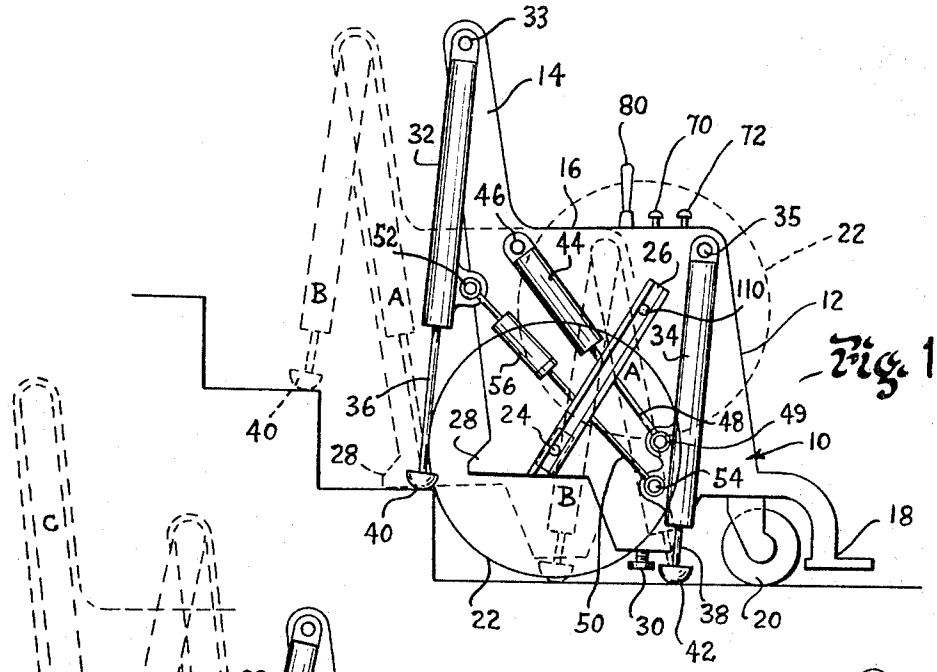


Fig. 1

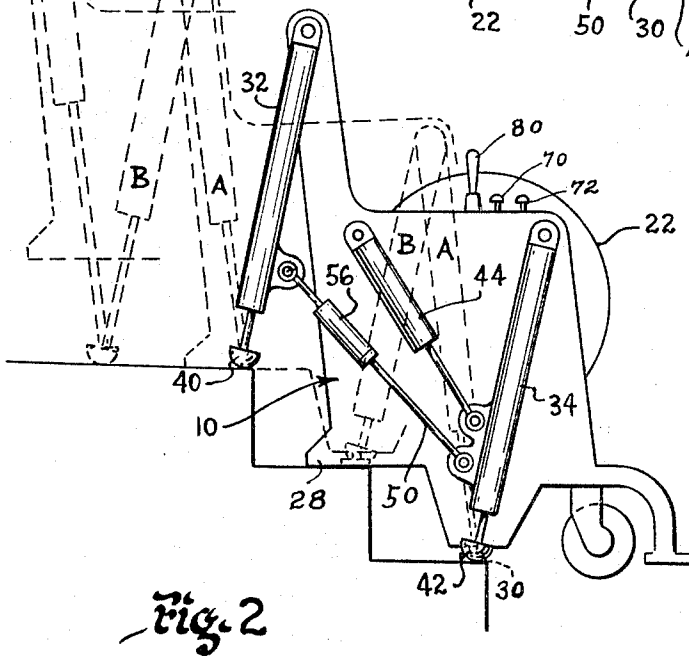


Fig. 2

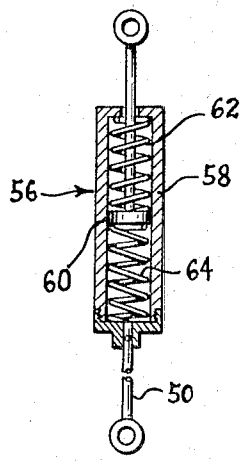


Fig. 3

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STAIR CLIMBING WHEEL CHAIR

Filed Dec. 6, 1965 2 Sheets-Sheet 2

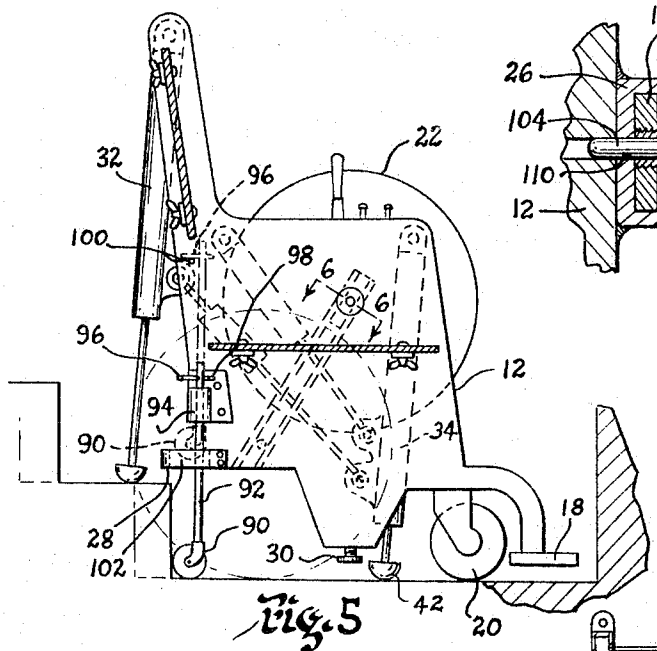


Fig. 5

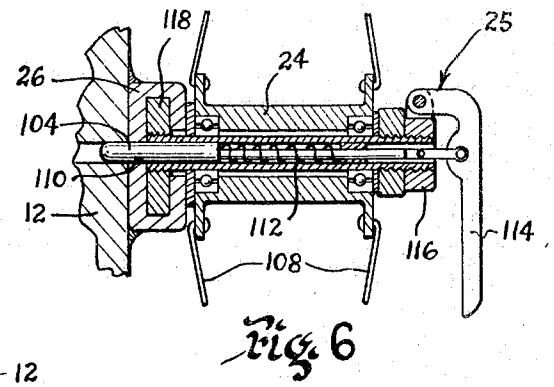


Fig. 6

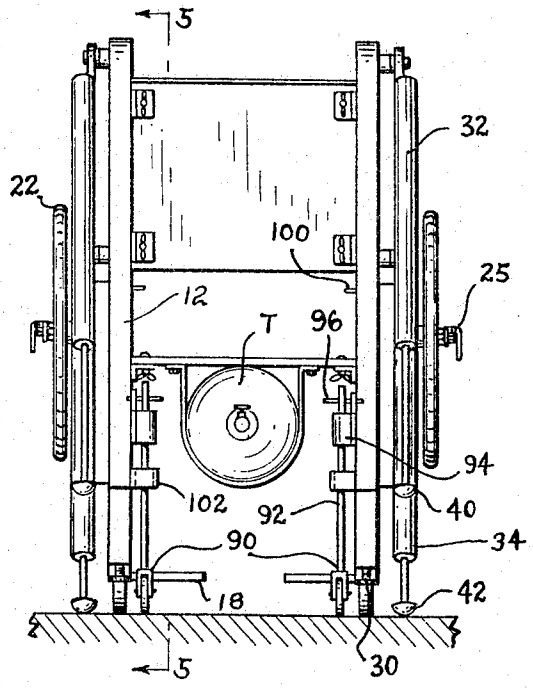


Fig. 4

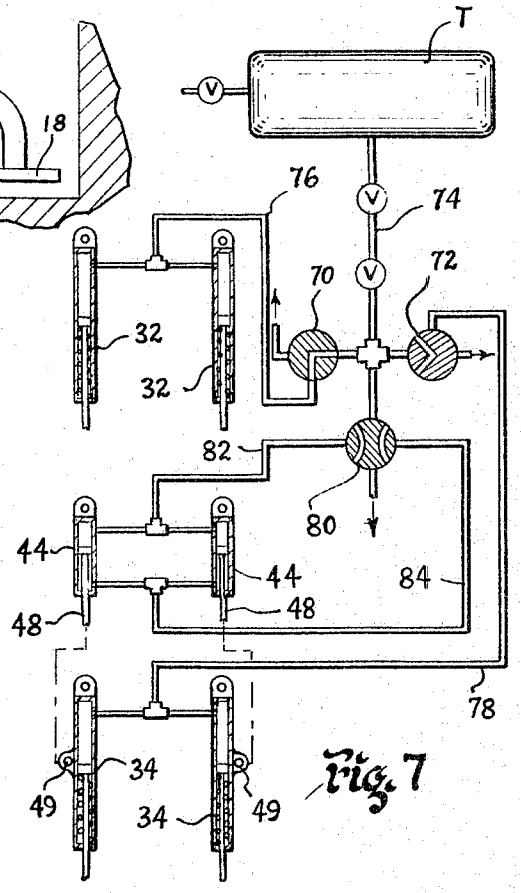


Fig. 7

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STAIR CLIMBING WHEEL CHAIR

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Filed Dec. 6, 1965, Ser. No. 511,741
9 Claims. (Cl. 180—8)

This invention relates to wheel chairs for invalids, and it relates more particularly to wheel chairs which enable the occupant to travel safely up or down stairs and over curbs, as well as on the level, the present application being a continuation-in-part of my copending application Ser. No. 350,263 filed March 9, 1964, and now abandoned.

A primary object of my invention is to provide a wheel chair which is equipped with a mechanical means for climbing up and down stairs and over curbs, while at the same time has all the features of a conventional hand-propelled wheel chair so that the occupant can maneuver the chair in the usual manner. Conventional wheel chairs, including those having power for driving the wheels can not negotiate stairs, steps, or in some cases street curbs, without the assistance of an attendant. Even then, it is difficult if not impossible to do, and it may be extremely dangerous, especially when an attempt is made to lift the chair and its occupant manually up a stairway of any length. In many cases the occupant does not have sufficient strength in his arms or hands even to manipulate a chair over a curb.

There are accordingly many situations where an invalid could get around in a wheel chair if the chair were provided with an easily operated power-driven climbing mechanism, so that it can be positively maneuvered up and down stairs or over curbs.

Another object of the invention is to provide a climbing mechanism which can be incorporated in the wheel chair of the collapsible type, so that the chair can fit easily into an automobile. Other important requirements of such wheel chair are that it operate with absolute reliability, in order to give the occupant a sense of confidence and assurance; that it be of strong construction, yet light in weight and compact; and that it have a suitable source of power for self-propulsion in situations where manual power is not sufficient.

These and other objects are attained by the present invention, wherein a wheel chair is provided with front and rear rests on which it can be supported in a substantially normal position when climbing a stairway or the like, while the wheels which are normally used are retracted. The chair is also provided with a pair of front legs and a pair of rear legs, which are pivoted so that they swing fore-and-aft of the chair. Each of the legs is extendible lengthwise of itself by means of a power device, so that the chair can be raised off its supporting rests for fore-and-aft movement on its legs. In addition, another power device is connected between the chair and at least one of the legs for pivotally driving the legs so that the chair can be moved forward or back while it is supported by the legs. Control means are likewise provided for operating the lifting and driving power devices, so that the occupant of the chair can raise the chair up on its legs, move it forward or back over a stair or stairs and set it down on its rests on the stairs. The legs are then retracted, swung into position on the next set of steps and extended to raise the chair again, so that it can be moved into a new position, either up or down the stairs, or even on the level or other walking surface.

As will become apparent from the description of one embodiment of the invention which is shown in the accompanying drawings, each lifting leg may consist of a power cylinder, one end of which is pivoted to the

chair, the piston rod of each power cylinder being directed downward for engagement with the surface along which the chair is traveling. The power means for moving the chair fore-and-aft may also be power cylinders, which are preferably connected to the legs at the front of the chair. In order to position the rear legs at the desired point on the stair when the legs are retracted and while the chair rests on its said support means, connecting rods may be provided between the front and rear legs so that both front and rear legs are swung into position simultaneously. This eliminates the need for shifting the front or rear legs independently of the other when they are raised off the floor. The piston rods of the lifting cylinders are extendable down into engagement with the floor or with the stairs, as the case may be, and the chair lifted vertically on said lifting legs from its support into a position so that it can be shifted forward or back onto the next step by means of the driving cylinders. While the chair is thus supported on its legs, the connecting rods between the legs are inoperative and must be provided with means which permit them to elongate or shorten so that the chair can be swung into position onto the next step. Consequently, as will be appreciated hereinafter, the connecting rods function only as a means of positioning the second pair of legs while said legs are retracted. However, instead of using the connecting rods between the legs, it may be desirable in some cases to provide driving cylinders for both the front and back legs, thereby making it possible to position each pair of legs completely independently of the other.

The stair climbing mechanism of the present invention makes it possible for a person confined to the chair to negotiate stairs or steep slopes which conventional wheel chairs can not handle. Moreover, the climbing mechanism can be controlled positively so that the chair does not tilt or tumble, endangering the occupant thereof. These and other advantages of the invention will become more apparent from the specific description hereinafter of one particular embodiment of the invention shown more or less diagrammatically in the accompanying drawings, wherein

FIG. 1 is a side elevational view of a stair climbing wheel chair in accordance with my invention, the chair being shown in the starting position as it is about to climb a set of stairs;

FIG. 2 is a view similar to FIG. 1, but showing the chair as it approaches the top of the stairs, and with the right driving wheel and mounting channel therefor removed for purposes of clarity;

FIG. 3 is a longitudinal section through the length adjusting device for a connecting rod for the climbing mechanism;

FIG. 4 is a rear view of a modified form of wheel chair embodying the invention,

FIG. 5 is a vertical section taken on the line 5—5 of FIG. 4 and looking in the direction of the arrows;

FIG. 6 is a detail view in section taken on the line 6—6 of FIG. 5, showing a spring latch device for positioning the driving wheels for the chair; and

FIG. 7 is a diagram of the pneumatic system for operating the chair climbing mechanism.

Referring more particularly to FIGS. 1 and 2 of the drawings the chair **10**, which is desirably constructed of light, rigid side frames **12**, each having a back portion **14**, horizontal arm rest **16**, and foot rest **18**. Side frames **12** are spaced laterally of each other and are connected by a collapsible structure, which forms the seat and back rest for the chair as in conventional wheel chairs. A pair of swivel wheels **20** are provided just to the rear of the foot rest **18**, and two large driving wheels **22**, having hand

rims for manually propelling the chair, are provided, one on either side of the chair.

As will be more apparent hereinafter, driving wheels **22** are mounted so that they can be raised from their normal position for operation on level terrain, to a stair climbing position, as shown in broken lines in FIG. 1, where they do not interfere with the movements of the chair as it is climbing the stairs. Thus, the hubs **24** for the rear driving wheels **22**, are slidably mounted in a channel track **26**, which is fixed to the side frames **12** of the chair and inclined upwardly and forwardly, as shown in FIG. 1. When the driving wheels **22** are located in their normal position for use in traveling on level ground, they are locked in place by means of a spring plunger **25**, such as that shown in FIG. 6 and more fully described hereinafter. On the other hand, when the chair is supported on the stair climbing mechanism, driving wheels **22** are moved up to the upper end of tracks **26** by disengaging the spring plunger and lifting the wheels **22** into their inoperative position shown in FIG. 1 where they are again locked in position while the stair-climbing mechanism is in use.

The base of each side frame **12** of the chair is provided with fixed rear and front rests **28** and **30**, respectively, when it is resting on two adjacent steps, as shown in FIG. 2. To this end, rear rests **28** are disposed approximately one stair-riser distance above front rests **30**. Moreover, each rest **30** is provided with a vertical adjustment within easy reach of the occupant, in order to accommodate steps of different height. When the driving wheels **22** are in the normal position, as shown in solid lines in FIG. 1, for traveling on level ground, rests **28** and **30** are well above the ground so that they do not interfere with the normal operation of the chair.

Chair **10** is designed in this instance to go up and down stairs with the occupant facing down the stairs, and to this end is provided with two pairs of lifting legs, one pair being pivotally mounted on the chair near the front, and the other at the back of the chair. The rear legs consist of a pair of power cylinders **32**, each pivotally connected at one end **32** to the upper end of the back **14** on opposite sides of the chair. In like manner, the front legs consist of a pair of power cylinders **34**, each pivoted at one end **35** to the front end of arm rest **16** on each side of the chair. Cylinders **32** and **34** are so mounted that they swing in planes parallel to the side frames **12** of the chair on opposite sides thereof. It is desirable, moreover, that the pivot points of cylinders **32** and **34** be located one above the other on a line which is more or less parallel with the line defined by rests **28** and **30**. In the particular embodiment of the invention here shown, power cylinders **32** and **34** are pneumatically operated and are supplied compressed air from a container or tank T (FIG. 7) suitably mounted on the chair. For this purpose a conventional pressure tank, reducing and regulating valves, such as those used in skin diving, may be employed. Alternatively, hydraulic cylinders may be used with power furnished by a battery-operated electric pump.

Each of cylinders **32** and **34** has a downwardly extending piston rod **36** and **38**, respectively, having a shoe or pad **40** and **42**, respectively, at its free end. In this particular instance cylinders **32** and **34** are single-acting, air being supplied at their upper ends above their pistons so that the chair can be raised bodily off its rests **28** and **30**. In addition each cylinder is provided with a return spring for retracting shoes **40**, **42** off the ground, so that they can be moved onto another step, as will be more apparent hereinafter. The rear cylinders **32** have a stroke which is at least twice as long as the height of the tallest step to be encountered, so that the back of the chair can be lifted a distance equal to twice the height of each stair. The stroke of the piston rods of the front cylinder **34**, on the other hand, need only be long enough to lift the chair a distance equal to the height of one stair. This difference in cylinder strokes is due to the fact that when the chair is leaving or entering the top of a stairway, the rear cylinders must extend two stair-riser lengths down from its fully retracted position into engagement with the floor, as indicated in the broken-line position C in FIG. 2. However, in the arrangement here shown where the chair faces outward, the front cylinders need to extend only one stair-riser length. The foregoing will become more apparent from the description of the operation of the chair hereinafter.

In order to move the chair in a horizontal direction when it is carried on lifting cylinders **32**, **34**, another pneumatic cylinder **44** (herein referred to as the driving cylinder) is pivotally mounted at **46** on each side frame **12** of the chair. The piston rod **48** of each driving cylinder **44** is pivotally connected at **49** to the corresponding front elevating cylinder **34** and swings it back and forth, in order to move the chair in a horizontal direction. Driving cylinders **44** are double-acting for positive control of the pivotal movement of elevating cylinders **34**. Thus, when the weight of the chair is taken on elevating cylinders **32**, **34**, extension of piston rods **48** of driving cylinders **44** causes front lifting cylinders **34** to swing counterclockwise, as viewed in FIGS. 1 and 2, relative to the frame of the chair. This causes the chair to move backward, or to the left as shown in the drawings. Retraction of the piston rods **48** of cylinders **44** shifts the chair forward.

It will be apparent from the foregoing that driving cylinders **44** may be connected to either the front or rear pair of legs, since pivotal movement of any of the legs causes the chair to move horizontally. Moreover, pivotal movement of any of the legs, causes all of them to pivot together. When the chair is supported on the stairs on its rests **28** and **30**, the piston rods **36** and **38** of both sets of lifting cylinders are retracted so that they can be swung to a new position. Driving cylinders **44** are used in this instance to swing both the front lifting cylinders **34** and the rear lifting cylinders **32** into position simultaneously. However, in order to do this it is necessary to provide a connection rod **50** between the front and rear legs at each side of the chair, each connecting rod being pivotally connected to the lower ends of lifting cylinders **32** and **34** at pivot points **52** and **54**, respectively. Connecting rods **50** transmit the swinging movement of front elevating cylinders **34** to the rear cylinders **32** only when the shoes **40**, **42** of the elevating cylinders are retracted off the floor, so that both elevating cylinders can be swung into position simultaneously in preparation for the next step.

The pivot points **52** and **54** at which connecting rods **50** are pivoted to adjacent front and rear lifting cylinders are located equidistant from the respective pivot points **33** and **35** at which lifting cylinders **32** and **34**, respectively, are pivoted to the chair. Consequently, when the shoes **40**, **42** are raised from the floor upon retraction of piston rods **36**, **38**, cylinders **32**, **34** can be freely swung in unison on pivot points **33**, **35** by means of cylinders **44**. However when the chair **10** is moved in a horizontal direction as it is climbing the stairs, and especially as it enters or leaves the stairway, either at the top or bottom thereof, the length of the front and rear legs (i.e. the distance from the pivot points **33** and **35** to the shoes **40** and **42**, respectively) will not be equal. Under the circumstances lifting cylinders **32** and **34** will not swing through the same amount of rotation relative to each other, assuming of course that the shoes **40** and **42** on elevating cylinders **32** and **34** remain at the same place on the floor as the chair is shifted forward or back on its climbing legs. Accordingly, the distance between the pivot points **52** and **54** at which connecting rod **50** is fastened to cylinders **32** and **34** will increase or decrease slightly, depending on which way the chair is moved on its legs. Rod **50** therefore can not be of fixed length without interfering with the action of the climbing legs of the chair while they are actually moving the chair in a horizontal direction.

In order to allow for such increase or decrease in the distance between pivot points **52** and **54**, each connecting rod **50** is made in two sections connected by a compen-

sating coupling **56**, which permits rod **50** to increase or decrease in length, while at the same time transmits the motion of the front legs to the rear legs in order to position the shoes **40**, **42** at the desired points on the stairs while they are suspended above the floor. As may be seen in FIG. 3, each compensating coupling **56**, consists of an outer cylindrical housing **58**, to one end of which is fixed the lower section of connecting rod **50**. The upper section of connecting rod **50** fits through an opening in the top of housing **58** and has a plunger **60** attached to its inner end. Plunger **60** is normally held mid-way between the ends of housing **58** by opposing coil springs **62** and **64**, which are compressed between opposite ends of housing **58** and plunger **60**. Springs **62** and **64** are of sufficient strength to transmit the unloaded push or pull of front elevating cylinder **34** on rear cylinder **32** when their shoes **40**, **42** are lifted off the ground. However, when the chair is shifted up or down the stairs on its lifting cylinders **32**, **34**, plunger **60** inside compensating coupling **56** can move in either direction longitudinally of housing **58** so that connecting rod **50** will be elongated or shortened in order to compensate for the change in distance between the points **52** and **54** at which it is connected to cylinders **32** and **34**. Moreover, springs **62**, **64** should be light enough so that there is no danger of the connecting rods forcing the shoes **40**, **42** to slide on the steps or floor when they carry the weight of the chair.

It is of course apparent that connecting rods **50** can be replaced by suitable means for positioning the front and rear legs independently of each other. For example, each rear-leg cylinder **32** could be operated by another power cylinder similar to the cylinders **44** for the front legs and could be arranged to function in synchronism with cylinders **44** so that both the front and back legs swing in unison with each other, but with separate driving cylinders.

The lifting and driving cylinders of the stair-climbing mechanism may be operated by means of conventional pneumatic control valves and air supply lines shown by way of example in FIG. 7. Separate three-way control valves **70** and **72** are provided for elevating the chair on its stair-climbing mechanism. Control valves **70** and **72** can be manipulated individually to direct air from a main pressure line **74** to the rear lifting cylinders **32**, **32** through supply line **76**, and through supply line **78** to the front lifting cylinders **34**, **34**, respectively. Main pressure line **74** is supplied by pressure tank T and is provided with the usual cut-off and reducing valves. When valves **70** and **72** are in the position at which valve **70** is shown in the drawing, air pressure is supplied to the lifting cylinders in order to raise the chair to the desired level. By rotating these valves to an intermediate position illustrated by valve **72**, cylinders **32** and **34** are cut-off from the air supply, but the pressure in the cylinders is maintained. When it is desired to lower the chair valves **70** and **72** are rotated until the supply lines **76** and **78** to cylinders **32** and **34** are connected with the vent lines to each valve, releasing the air in said cylinders.

By using separate control valves for operating the front and rear lifting cylinders, the level of the chair fore-and-aft can be controlled by the occupant so that he will be more comfortable. If desired, the chair can be provided with suitable stops to prevent it from tilting too far in either direction when one or the other set of lifting cylinders is extended too far relative to the other. Furthermore, a self-leveling device can be readily installed in order to automatically keep the chair level.

A single four-way valve **80** controls the fore-and-aft movement of the chair when it is supported on its legs. Valve **80** has connections to the main air supply line **74**, supply-and-return lines **82** and **84** to driving cylinders **44**, **44**, and a vent line. When valve **80** is rotated 45° to the right from the position shown in FIG. 7, line **82** to the rear end of cylinders **44** is connected with the air supply while line **84** is vented, causing the piston rods **48** to extend. This moves the chair backward, if it is elevated on its legs or, if the chair is resting on its rests **28** and **30** with its shoes raised, extension of cylinders **44**, **44** pivots lifting cylinders **32**, **34** forward. By returning valve **80** counterclockwise to the position shown, movement of the chair horizontally on its climbing legs is stopped. Continued counterclockwise rotation of valve **80** through an additional 45° reverses the flow of air to cylinders **44**, causing the piston rods **48** to retract, thus reversing the pivotal movement of the cylinders **32** and **34**.

In climbing a set of stairs, the chair is backed up to the bottom of the stairs until the large driving wheels **22** engage the edge of the first step as shown in the full-line position of the chair in FIG. 1. The lifting cylinders **32**, **34** are then swung rearwardly and their piston rods **36**, **38** extended until the rear shoes **40** come in contact with the top of the first step and the front shoes **42** touch the floor. The weight of the chair is then removed from its driving wheels **22** and swivel wheels **20** by extending cylinders **32** and **34** a little more. With the weight removed driving wheels **22** can be slid up on their tracks **26** to their inoperative position indicated by the broken-line in FIG. 1 and the solid-line in FIG. 2, so that the chair can be moved closer to the stairs.

Valve **80** is then shifted so as to extend the piston rods of cylinders **44**, which pivot lifting cylinders **34** counterclockwise, as viewed in FIG. 1. Since at this point the weight of the chair is carried by the lifting cylinders, counterclockwise rotation of cylinders **34** about their pivot points **35** causes the chair to move back toward the stairs to the broken-line position shown in FIG. 1. As part of the weight of the chair and its occupant is also carried by the rear lifting cylinders **32**, these cylinders likewise pivot about the pivot points **33** simultaneously with cylinders **34**. Any elongation or contraction required of connecting rods **50** during this movement is taken care of by their compensating couplings **56**, which permit cylinders **32** and **34** to pivot freely without interference by connecting rods **50**. When the chair reaches its broken-line position in FIG. 1 its rear rests **28** are located above the first step. The lifting cylinders **32** and **34** are then vented by operating control valves **70** and **72**. This lowers the rear rests **28** of the chair onto the first step and the front rests **30** onto the floor. Continued venting of lifting cylinders **32** and **34** causes their piston rods to fully retract by the return springs in said cylinders, lifting shoes **40** and **42** off the ground. At this point lifting cylinders **32** and **34** are swung as far forward as they will go with respect to the chair to a position designated by the letter A. Suitable stops (not shown) are provided on the chair in order to positively prevent cylinders **32** and **34** from swinging so far in this direction that the chair is in danger of toppling over backward.

With the shoes **40**, **42** lifted off the ground, valve **80** is reversed causing cylinders **44** to retract, thus pivoting front lifting cylinders **34** in a clockwise direction, which in turn pivot rear cylinders **32** a like amount through connecting rods **50**. When cylinders **32**, **34** reach the broken-line positions designated B, the rear shoes **40** are located above the second step, so that they can be lowered into engagement therewith, and the front shoes **42** will engage the floor rearward of their initial position. Again positive stops (not shown) are provided on the chair for preventing cylinders **32**, **34** from pivoting too far in a clockwise direction, which would cause the center of gravity of the chair to be located too far forward with respect to the shoes **40**, **42**, so that when it is elevated by cylinders **32**, **34**, it would be in danger of toppling forward.

By manipulating lift control valves **70** and **72** the lift cylinders **32** and **34** are extended elevating chair **13** until its rear rests **28** are level with the next step. Control valve **80** is then shifted so as to supply air to the top of driving cylinders **44** while venting their opposite sides, causing the chair to move back. When rear rests **28** of

the chair are located over the second step and the front rests **30** over the first, the lifting cylinders are vented so that the chair is brought to rest on these two steps. With retraction of the shoes **40**, **42**, the lifting cylinders are again swung rearwardly from their A positions to their B positions, as indicated in broken-lines in FIG. 2 and the step-by-step climbing operation repeated. In order to facilitate manipulation of the chair so that it can be simultaneously raised and moved horizontally on its climbing legs, a single elevating control valve may be employed, which will operate both front and back lift cylinders together and at the same time provide control for leveling the chair. The occupant of the chair can then have one hand on the elevating control and the other on the fore-and-aft control so that they can be operated together.

FIG. 2 illustrates the situation arising when the chair reaches the top of a flight of stairs. It will be noted that in this situation, the rear lifting cylinders **32** are already extended a riser-height when their shoes **40** engage the landing in their B positions. Consequently, as the chair is raised so as to bring the forward rests **30** up to the height of the landing, and then swung back to the position indicated in FIG. 2 as C, the rear lifting cylinder **32** must extend two riser-heights of the stairs. The front lifting cylinders **34**, however, still need extend only one riser-height. When the chair has reached the top of the stairway and while its lifting cylinders are fully extended, the large driving wheels **22** are lowered into their normal operating positions and locked in place. The lifting cylinders **32**, **34** are then retracted, bringing the weight of the chair onto its wheels **22**, and the chair moved back from the stairs in the usual manner.

It will be noted that when lifting, cylinders **32**, **34** are retracted and pivoted forward into their A positions, they are out of the way and take up very little space. Furthermore, since the climbing mechanism at each side of the chair is mechanically distinct from the other, the chair can be made collapsible for storage or transportation purposes. High-pressure flexible hose connections between the controls and the power cylinders are also used for the same reason.

Referring now more particularly to FIGS. 4 and 5, it may be desirable for some purposes to provide the chair shown in FIGS. 1 and 2 with a set of auxiliary casters **90** at the back of each side frame **12**, in order to facilitate use of the climbing mechanism in various situations without the necessity of lowering the driving wheels **22**. For example, if the stairway to be negotiated by the chair has a landing in the middle of it from which the stairs run in different directions, it is necessary upon reaching the landing to change the direction of travel. In order to do this without auxiliary casters **90**, the driving wheels **22** must be lowered. Furthermore, if the landing is small, there may be insufficient room on it to turn the wheel chair with the large wheels **22** in place. By using the small auxiliary casters **90**, however, the wheel chair can be turned in a much smaller space, as indicated in full lines in FIG. 5, as opposed to the substantially larger space required (broken-line showing), if the driving wheels **22** are lowered. Except for the auxiliary casters **90**, the chair shown in FIGS. 4 and 5 is in all respects the same as that of FIGS. 1 and 2, and the same reference characters are used to designate like parts.

Casters **90** are each mounted on a vertically slidable post **92**, which is held in a guide sleeve **94** mounted on the inner side of each side frame **12** of the chair. Post **92** slides freely up and down in guide sleeve **94** so that caster **90** can be moved into and out of operative relation with the floor as shown in full lines in FIG. 5. The upper end of post **92** is provided with a handle **96** which extends laterally from both sides of the post. When the caster **90** is lowered to the operative position, one end of handle **96** is aligned with a locking slot **98** in the mounting bracket for guide sleeve **94**. By grasping handle **96** and turning post **92** about its longitudinal axis, one end of handle **96** can be readily engaged in locking slot **98**, thus locking the auxiliary caster **90** in its operating position.

To store auxiliary caster **90** in its inoperative position, handle **96** is disengaged from locking slot **98** and raised to the broken-line position shown in FIG. 5 where handle **96** is simply latched over a peg **100** projected inwardly from the side wall **12** of the chair. Casters **90** fit through an opening in a bracket **102** fixed to the inside of the side frame of the chair and forming a part of the rear rest **28**, on which the chair is supported when climbing stairs.

In addition to making it possible to negotiate tighter places, auxiliary casters **90** can be employed in leaving or approaching the top of a set of stairs where it would be more convenient for some people to use the auxiliary casters **90** near the edge of the top step rather than to raise or lower the large driving wheels **22** at this point.

It will be noted that FIG. 4 illustrates how the air pressure tank T may be suitably carried under the seat of the chair. The spring plungers **25** for latching the driving wheels **22** in place are also shown in FIG. 4. FIG. 6 shows the wheel latching device in greater detail. Thus, a plunger **104** extends through the hub **24** of each driving wheel, represented in FIG. 6 by the spokes **108**. The inner end of plunger **104** is urged into engagement with locating holes **110** in track **26** and side frame **12** by a coil spring **112**. The outer end of plunger **104** is pivotally connected to a lever **114**, which is pivoted at one end to a nut **116** at the outer end of hub **24**. When it is desired to shift the position of driving wheel **22**, the occupant pulls the free end of lever **114** out, in order to withdraw plunger **104** from the locating hole **110**. The wheel **22** can then be moved on a slide plate **118** up or down track **26** to its other position, where plunger **104** automatically re-engages in a second locating hole **110** and holds the wheel securely in place.

What is claimed is:

1. A wheel chair comprising in combination,

(A) a pair of wheels rotatably and retractably mounted on the chair for supporting the same when traveling on substantially level ground,

(B) front and rear rests on said chair for supporting said chair in a substantially normal position on a walking surface, such as stairs, when said wheels are retracted,

(C) a pair of front legs pivotally mounted adjacent the front of said chair,

(D) a pair of rear legs pivotally mounted adjacent the rear of said chair,

(E) each of said legs being mounted to swing fore-and-aft of the chair and being extendible lengthwise for engagement of its free end with said walking surface,

(F) drive means connected between said chair and at least one of said legs for pivoting the same,

(G) power means for extending said legs and for actuating said drive means such that said chair can be raised off said front and rear rests and moved forward or back, and

(H) means for controlling said power means such that the occupant of the chair can sequentially raise the chair on said legs, move it forward or back while supported on said legs, and lower the chair onto said rests.

2. A wheel chair as defined in claim **1**, wherein said drive means is drivingly connected to at least one of said legs on each side of the chair.

3. A wheel chair as defined in claim **1**, wherein said legs are provided with means for retracting their free ends from engagement with said walking surface, and which further includes a connecting rod between said front and rear legs at each side of the chair for pivoting said legs simultaneously when said chair is supported on its said rests and when the free ends of said legs are retracted from said walking surface.

4. A wheel chair as defined in claim 3, wherein said connecting rod is provided with a compensating coupling which permits it to be elongated or shortened in order to compensate for any non-parallelism between the free ends of said legs at each side of the chair when resting on said walking surface and the pivot points of said legs when said chair is moved forward or back on said legs.

5. A wheel chair as defined in claim 1, wherein each of said legs comprises a power cylinder pivoted at one end to said chair and having a piston rod by which its other end is extended into engagement with said walking surface.

6. A wheel chair as defined in claim 5, wherein said drive means comprises a pair of double-acting power cylinders, each operatively connected to one of said front legs.

7. A wheel chair as defined in claim 6, wherein said power cylinders for extending and pivoting said legs are pneumatically operated and said power means comprises a tank of compressed air connected to said power cylinders.

8. A wheel chair as defined in claim 1, wherein said wheels comprise a pair of large drive wheels having means for locking them in an operative position for normal travel of the wheel chair on substantially level ground and

for moving and for locking them in an inoperative position where they do not interfere with said front and rear rests when climbing stairs or the like, said chair being further provided with a pair of small auxiliary wheels retractably mounted adjacent said rear rests for use in place of said large drive wheels.

9. A wheel chair as defined in claim 8, wherein said auxiliary wheels each comprise a caster mounted on a substantially vertically disposed post, and which further includes a guide sleeve mounted on said chair and receiving said post for slidably supporting the same, and means for latching said post in a lowered position at which its caster can support said chair and in a raised position at which said caster is inoperative.

References Cited by the Examiner

UNITED STATES PATENTS

468,022	2/1892	Bray	280—5.28
2,701,005	2/1955	Bennett et al.	280—5.3
3,150,733	9/1964	Goebel	180—8

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