Feb. 14, 1967 R. B. WENGER 3,304,094

CLIMBING WHEEL CHAIR

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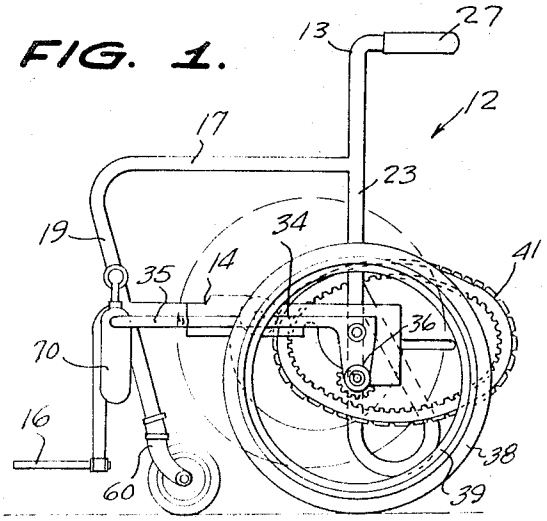
FIG. 1.



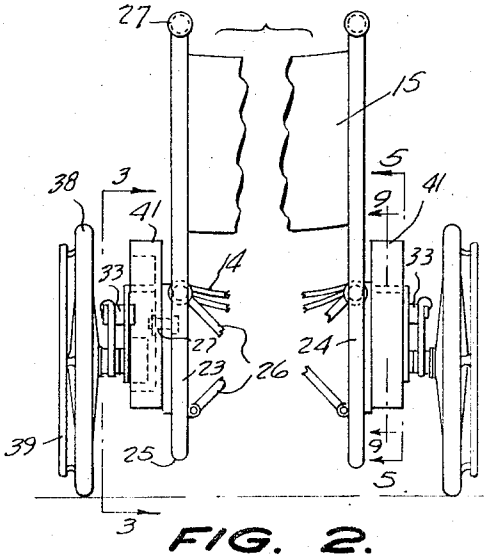




FIG. 2.

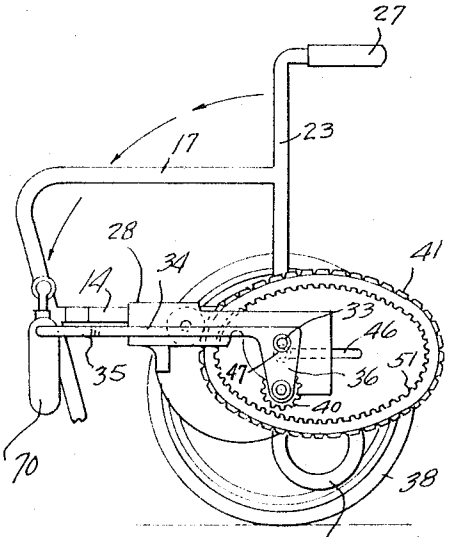



FIG. 3.

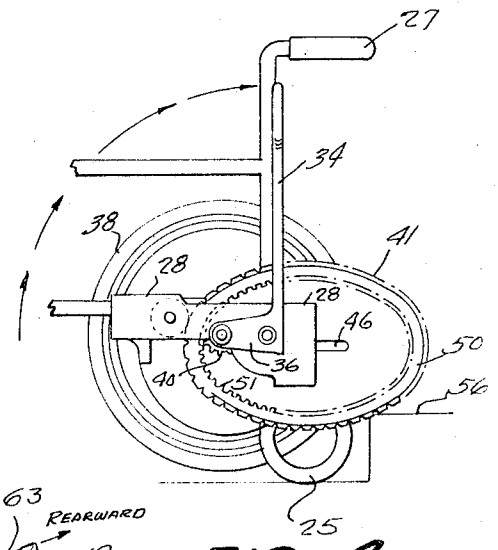
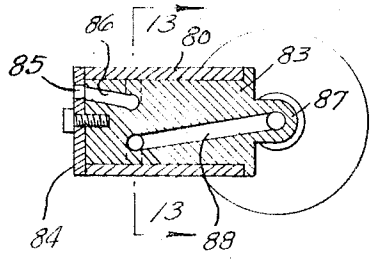



FIG. 4.

FIG. 12.



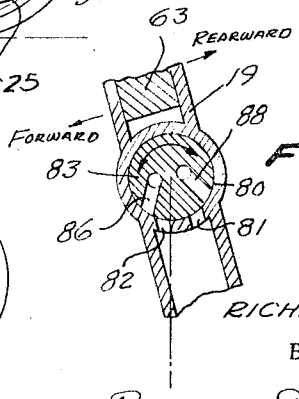




FIG. 13.

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FIG. 5.

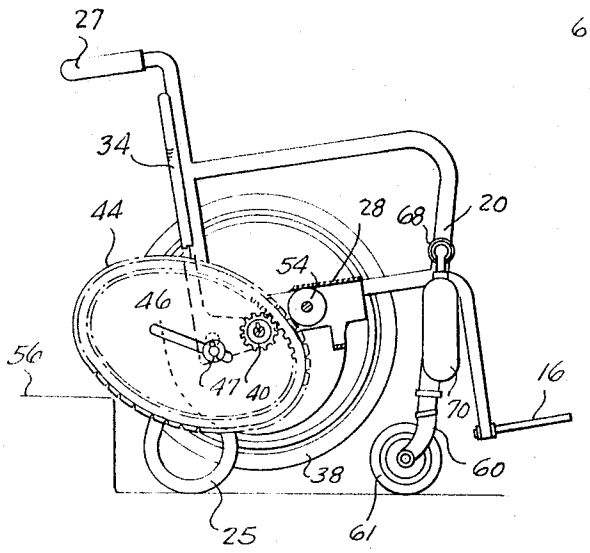
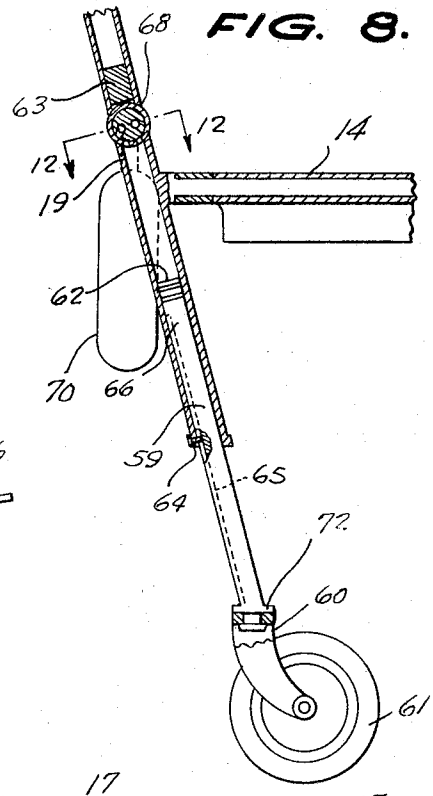



FIG. 8.



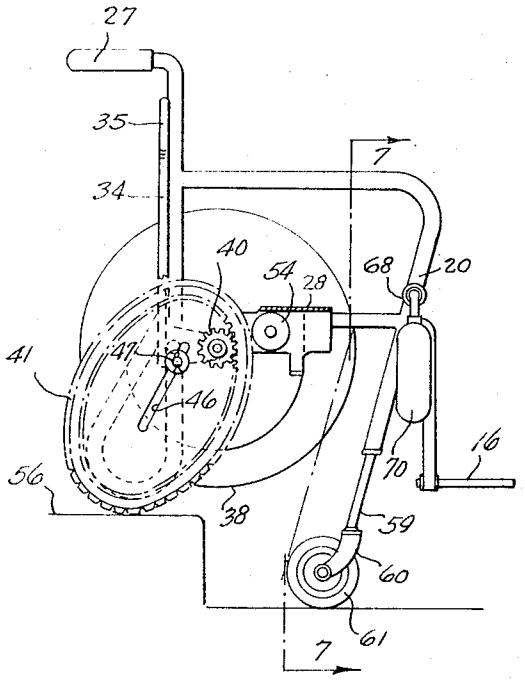




FIG. 6.

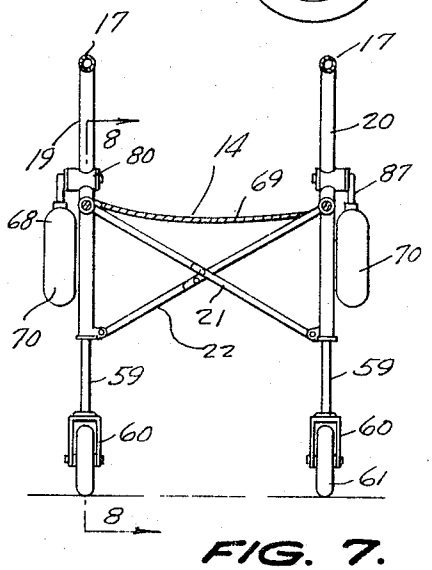



FIG. 7.

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FIG. 9.

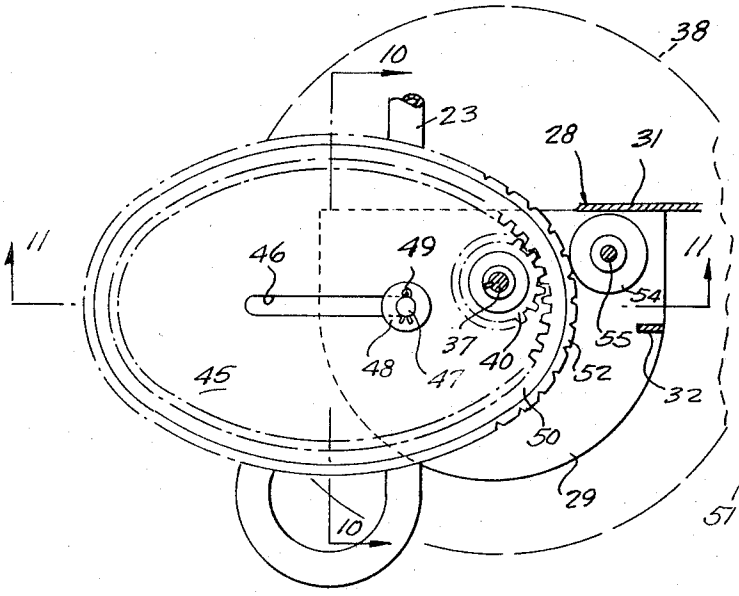
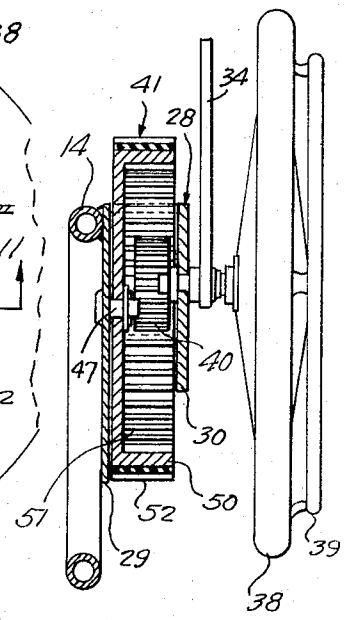



FIG. 10.



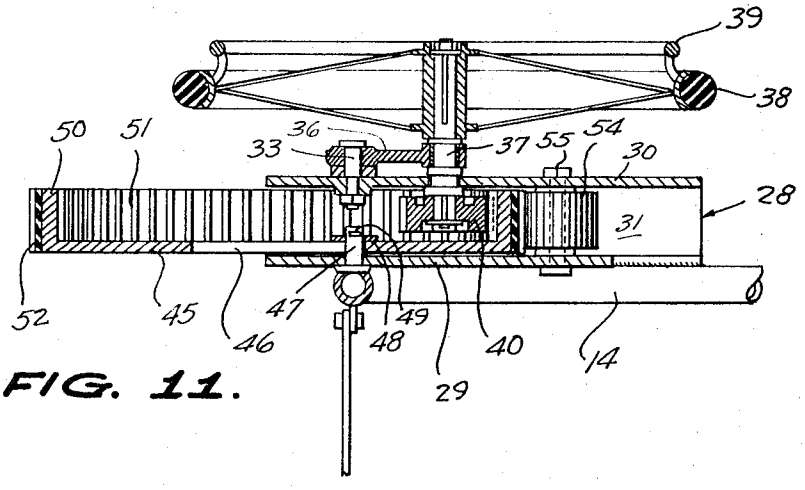




FIG. 11.

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# CLIMBING WHEEL CHAIR

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Filed Dec. 22, 1964, Ser. No. 420,266
10 Claims. (Cl. 280—5.2)

This invention relates to improvements in wheel chairs, and more particularly to a wheel chair adapted to move up or down steps or stairs.

A main object of the invention is to provide a novel and improved stair-climbing wheel chair which is relatively simple in construction, which is easy to operate, and which enables the occupant to safely climb or descend stairs with a relatively small amount of effort and without leaving the wheel chair.

A further object of the invention is to provide an improved stair-climbing wheel chair which involves relatively inexpensive components, which is durable in construction, and which includes automatic fluid pressure-operated levelling means which may be employed when the wheel chair is on a level surface as well as during stair-climbing or descending operation of the wheel chair.

A still further object of the invention is to provide an improved stair-climbing wheel chair which is relatively light in weight, which is compact in size, which employs relatively few parts, and which is easy to maintain in operating condition.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of an improved stair-climbing wheel chair constructed in accordance with the present invention, shown in normal condition.

FIGURE 2 is a fragmentary rear elevational view of the wheel chair of FIGURE 1.

FIGURE 3 is a vertical cross sectional view taken substantially on the line 3—3 of FIGURE 2.

FIGURE 4 is a fragmentary vertical cross sectional view, similar to FIGURE 3, but showing the chair adjusted for climbing stairs.

FIGURE 5 is a vertical cross sectional view, similar to FIGURE 4, but taken on the line 5—5 of FIGURE 2 and showing the position of the ellipsoidal chair-elevating members as they are rotated into engagement with a stair step.

FIGURE 6 is a vertical cross sectional view, similar to FIGURE 5, showing the position of the chair as it is elevated on a stair step and maintained levelled by the action of the pneumatic levelling means associated with the wheel chair.

FIGURE 7 is a cross sectional view taken substantially on the line 7—7 of FIGURE 6.

FIGURE 8 is an enlarged cross sectional view taken substantially on the line 8—8 of FIGURE 7.

FIGURE 9 is an enlarged vertical cross sectional view taken substantially on the line 9—9 of FIGURE 2, with the chair adjusted for stair climbing as in FIGURES 4 and 5.

FIGURE 10 is a vertical cross sectional view taken substantially on the line 10—10 of FIGURE 9.

FIGURE 11 is a horizontal cross sectional view taken substantially on the line 11—11 of FIGURE 9.

FIGURE 12 is an enlarged cross-sectional view taken substantially on line 12—12 of FIGURE 8.

FIGURE 13 is a cross-sectional view taken substantially on line 13—13 of FIGURE 12.

Referring to the drawings, 12 generally designates an improved stair-climbing wheel chair constructed in accordance with the present invention. The wheel chair 12 comprises a chair frame 13 having the seat portion 14, the back rest portion 15, and the foot rest portion 16.



The frame 13 is also provided with the arm rests 17, 17 located at the opposite sides of the seat portion 14, said arm rests merging with the parallel inclined tubular frame post elements 19 and 20 which are braced together and held in parallel relationship by a pair of foldable cross braces 21 and 22 interconnecting the lower portions of the tubular post members 19 and 20, as shown in FIGURE 7. The rear portion of the frame consists of the vertical tubular supporting posts 23 and 24 which are formed with the bottom floor-engaging loops 25 and which are connected together by foldable brace bars 26. The rear post members 23 and 24 are provided at their top ends with the rearwardly extending horizontal handles 27 located above the back rest portion 15, said handles being adapted to be grasped by a person pushing the wheelchair.

Secured rigidly to the respective sides of the seat frame 14 are rigid bracket members 28 of generally inverted U-shape in cross section and having depending inner vertical plate portions 29 secured to the seat frame 14 and outer vertical plate portions 30 spaced from and parallel to the plate portions 29. The bracket members 28 are provided with the horizontal top wall portions 31 which connect the rear portions of the top edges of the plate elements 29 and 30. The rear portions of the plate members 29 and 30 are further rigidly connected together by horizontal cross bars 32.

Pivotally connected to the plate members, 30 on transversely aligned axes, at 33, 33 are respective levers 34, 34 which project forwardly adjacent the sides of the seat frame 14 and are normally in horizontal positions adjacent and parallel to said seat frame sides, as shown in FIGURE 1. The levers 34 are provided at their ends with the handle portions 35 located so as to be easily reached by the occupant of the wheel chair. Projecting downwardly from the pivoted ends of the respective levers 34 are arms 36 integrally formed with said levers and arranged substantially at right angles to the levers. Respective transverse shafts 37 are journaled in the end portions of the arms 36, and rigidly secured on the outer portion of each shaft 37 is a supporting wheel 38 provided with an outwardly adjacent coaxial annular rim 39 which may be manually grasped by the occupant of the wheel chair for rotating the wheel 38.

Rigidly secured on the inner end portion of each shaft 37 is a pinion gear 40. Designated at 41, 41 are respective elliptical wheels located in vertical longitudinal planes at opposite sides of the seat frame 14 with their forward portions received between the respective pairs of vertical plate members 29 and 30 of the brackets 28, 28. Each elliptical wheel 44 comprises an elliptical main body portion 45 formed with a longitudinal slot 46 which extends along the major axis of the elliptical body 45 and which is slidably and rotatably engaged on a transversely extending pivot pin 47 rigidly secured in the adjacent plate element 29, the inner end portion of the pin being provided with a retaining washer 48 and retaining cotter pin 49. The body portion 45 of each of the elliptical wheels 41, 41 is thus constrained to slide and rotate on the associated transversely extending pivot pin 47.

Each of the elliptical wheels 41, 41 is provided with a continuous peripheral rim flange 50 extending around the edge of its associated main body portion 45, the rim flanges being provided with internal gear teeth 51 and with external tread portions 52 of suitable resilient deformable friction material, such as rubber, or the like. The gear teeth 51 are meshingly engageable by the pinion gears 40 when the levers 34 are rotated upwardly from their horizontal positions shown in FIGURE 1. The elliptical wheels are restrained against forward movement by the provision of idler rollers 54 which are journaled between the adjacent plate members 29 and 30 on transverse shafts

55. The rollers 54 are so located that when the levers 34 are elevated to cause the pinion gears 40 to meshingly engage with the gear teeth 51, the peripheries of the associated elliptical wheels are moved into engagement with the rollers allowing the elliptical wheels to be rotated responsive to the rotation of the shaft 37, which in turn may be operated by means of the driving rims 39. As will be further apparent, when the levers 34 are rotated upwardly, for example, to the upstanding vertical positions illustrated in FIGURE 4, the supporting wheels 38 are elevated sufficiently to allow the bottom loops 25 of the rear post members 23 to come into ground engagement, the supporting wheels 38 being lifted clear of the ground, as shown in FIGURE 4.

As shown in FIGURES 1, 3 and 4, the elliptical wheels 41 are normally arranged with their major axes extending substantially horizontally and rearwardly, the pivot pins 47 being in the forward portions of the guide slots 46. With the levers 34 in their upright positions, as shown in FIGURE 4, rotation of the respective wheels 38 in a clockwise direction, as viewed in FIGURE 4, will cause their associated elliptical wheels 41 to be also rotated clockwise around their associated pivot pins 47, whereby the elliptical wheels may be employed as elevating means to raise the rear portion of the wheel chair onto a stairway step 56.

The operation may be repeated for subsequent steps in the manner illustrated in FIGURES 5 and 6.

Telescopically disposed in the respective tubular front leg portions 19, 20 are plunger rod members 59, 59 provided at their lower ends with swiveled caster assemblies 60 having the caster wheels 61. The piston rods 59 have top piston portions 62 which are sealingly and slidably engaged in the tubular leg members 19 and 20 in a chamber defined below a filler plug 63 provided in each leg. Each leg is further provided with an inwardly projecting stop pin 64 slidably engaging in a longitudinal groove 65 formed in the associated piston rod 59 and terminating subjacent the associated piston portion 62, as shown at 66, to limit the downward extension of the associated piston rod.

Each leg member 19 and 20 is provided with an outwardly extending horizontal rotary valve barrel 80 formed with spaced ports 81, 82 in its bottom wall communicating with the subjacent space in the leg member. Each valve barrel is provided with a rotatable core 83 having an outer retaining disc 84 rigidly secured thereto, said disc being formed with a vent aperture 85 communicating with a passage 86 formed in the core and located so as to register with port 82 when the leg member is swung in a clockwise direction from the position of FIGURE 13.

The inner end of each core 83 is formed with a depending conduit 87 communicating with a passage 88 formed in the core and located so as to register with the port 81 when the associated leg member is swung in a counterclockwise direction from the position of FIGURE 13.

Detachably connected to each depending conduit 87 is a compressed air bottle 70 of substantial weight, acting to maintain the associated conduit 87 in a vertical position at all times.

As will be apparent when the chair is tilted forwardly through a predetermined angle such as to cause ports 81 to register with the ends of passages 88, compressed air from the bottles 70 is admitted into the leg members 19 and 20, depressing their piston portions 62 and extending the piston rods 59 downwardly. Similarly, when the chair is tilted rearwardly through an angle such as to cause ports 82 to register with the ends of passages 86, ports 88 are sealed off and the leg members are allowed to exhaust to atmosphere until the leg members descend sufficiently relative to their piston rods 59 to restore the level condition of the chair shown in FIGURE 13.

In the normal condition of the wheelchair, namely, when the wheelchair is on level ground, the bottom rims of the leg members 19 and 20 abut the base flange portions 72 immediately adjacent to the caster assemblies 60.



In operation, when the occupant desires to ascend a series of stair steps 56, he moves the wheelchair into the position sohwn in FIGURE 4 so that the rearwardly projecting portions of the elliptical wheels 41 extend over the first step 56 on which the chair is to be elevated. The occupant then raises the levers 34 to their upright positions, as shown in FIGURE 4, which brings the pinion gears 40 into meshing engagement with the internal teeth 51 of the elliptical wheels and simultaneously elevates the normal supporting wheels 38 above ground level, whereby the rear portion of the wheel chair is supported on the bottom loops 25 of the rear leg elements of the chair. The wheels 38 are then rotated manually by means of the driving rims 39 to rotate the elliptical wheels in the manner shown in FIGURES 5 and 6 so as to elevate the rear portion of the wheel chair. This causes the chair to tilt sufficiently to admit compressed air into the working spaces in the leg portions 19 and 20 of the chair so as to maintain the chair level. The elliptical wheels 41 will elevate the chair onto the successive steps and the chair will be supported in level position by the engagement of the caster wheels 61 with the preceding steps. After the series of steps have been climbed and the rear portion of the chair is on the desired upper level, the lever members 34 may be returned to their horizontal positions, and the leg members 19 and 20 will be in tilted positions causing the ends of passages 86 to register with ports 82, allowing the working spaces in the leg members 19 and 20 to exhaust, so that the chair will be returned to its normal position, shown in FIGURE 1, for movement on a level surface.

In descending a flight of stairs, the caster assemblies 60 will be lowered, as required, to maintain the wheel chair level as the chair is moved downwardly along said flight of stairs. Upon reaching the bottom level, the caster assemblies 60 will be allowed to retract to their normal positions by the cooperation of the valve barrels 80 with the valve cores 83 in the manner above described to exhaust the working spaces above the piston elements 62.

While a specific embodiment of an improved wheel chair has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. A wheel chair comprising a seat frame having depending rear supporting leg means and depending front supporting leg means, supporting wheels connected to the seat frame at its opposite sides, respective elliptical wheels slidably and pivotally connected to the opposite sides of the seat frame at the rear portion thereof and arranged in vertical longitudinal planes, means to rotate said elliptical wheels into engagement with a rearwardly adjacent stair step, whereby to elevate the rear portion of the seat frame, respective caster assemblies slidably connected to the front supporting leg means at the opposite sides of the seat frame, and means to at times extend said caster assemblies downwardly so that the seat frame may be levelled and when the rear portion thereof is raised or lowered.

2. A wheel chair comprising a seat frame having depending rear supporting leg means and depending front supporting leg means, supporting wheels connected to the seat frame at its opposite sides, respective elliptical wheels slidably and pivotally connected to the opposite sides of the seat frame at the rear portion thereof and arranged in vertical longitudinal planes, means to at times drivingly connect said supporting wheels to said elliptical wheels, whereby said elliptical wheels may be rotated responsive to rotation of said supporting wheels and whereby said elliptical wheels may be rotated into engagement with a rearwardly adjacent stair step so as to elevate

the rear portion of the seat frame, respective caster assemblies slidably connected to the front supporting leg means at the opposite sides of the seat frame, and means to at times extend said caster assemblies downwardly so that the seat frame may be levelled when the rear portion thereof is elevated.

3. A wheel chair comprising a seat frame having depending rear supporting leg means and depending front support legs at the opposite sides of the front portion of the seat frame, supporting wheels connected to the seat frame at its opposite sides, respective elliptical wheels slidably and pivotally connected to the opposite sides of the seat frame at the rear portion thereof and arranged in vertical longitudinal planes, means to at times drivingly connect said supporting wheels to said elliptical wheels, whereby said elliptical wheels may be rotated responsive to rotation of said supporting wheels and whereby said elliptical wheels may be rotated into engagement with a rearwardly adjacent stair step so as to elevate the rear portion of the seat frame, respective caster assemblies telescopically connected to the front supporting legs, and fluid pressure-operated means to at times extend said caster assemblies downwardly so that the seat frame may be levelled when the rear portion thereof is elevated.

4. A wheel chair comprising a seat frame having depending rear supporting leg means and a pair of depending front supporting legs, respective levers pivoted to opposite sides of said frame on aligned transverse axes, respective arms projecting from the pivoted ends of said levers, respective transverse shafts journaled in said arms, a supporting wheel secured on the outer end of each shaft, a pinion gear secured on the inner end of each shaft, respective elliptical wheels located in vertical longitudinal planes at opposite sides of said frame and having rim flanges receiving said gears, means slidably and rotatably connecting said elliptical wheels to said opposite sides of the frame, internal gear teeth on said rim flanges meshingly engageable by said gears when said levers are rotated upwardly, respective idler rollers transversely journaled on the frame forwardly adjacent and engageable by said rim flanges when said gears are moved into meshing engagement with said internal gear teeth, said arms being of sufficient length to elevate the supporting wheels when the levers are rotated upwardly and to bring said rear supporting leg means into ground engagement, respective caster assemblies slidably carried by said front supporting legs, and means to extend said caster assemblies downwardly so that the seat frame may be levelled when the rear portion thereof is elevated on a step by rotating said elliptical wheels thereon.

5. A wheel chair comprising a seat frame having depending rear supporting leg means and a pair of depending front supporting legs, respective levers pivoted to opposite sides of said frame on aligned transverse axes, respective arms projecting from the pivoted ends of said levers, respective transverse shafts journaled in said arms, a supporting wheel secured on the outer end of each shaft, a pinion gear secured on the inner end of each shaft, respective elliptical wheels located in vertical longitudinal planes at opposite sides of said frame, each elliptical wheel comprising an elliptical main body provided with a rim flange, said main body having a longitudinal slot, transverse pivot bolt means on the sides of the seat frame extending through said slots and slidably and rotatably connecting the elliptical wheels to the respective sides of the seat frame, internal gear teeth on the rim flanges, said rim flanges receiving said gears and the internal gear teeth being meshingly engageable by said gears when said levers are rotated upwardly, respective idler rollers transversely journaled on the frame forwardly adjacent and engageable by said rim flanges when said gears are moved into meshing engagement with said internal gear teeth, said arms being of sufficient length to elevate the supporting wheels when the levers are rotated upwardly and to bring said rear supporting leg means into ground engagement, respective caster assemblies slidably carried by said front supporting legs, and means to extend said caster assemblies downwardly so that the seat frame may be levelled when the rear portion thereof is elevated on a step by rotating said elliptical wheels thereon.



6. A wheel chair comprising a seat frame having depending rear supporting leg means and a pair of depending front supporting legs, respective levers pivoted to opposite sides of said frame on aligned transverse axes, respective arms projecting from the pivoted ends of said levers, respective transverse shafts journaled in said arms, a supporting wheel secured on the outer end of each shaft, a pinion gear secured on the inner end of each shaft, respective elliptical wheels located in vertical longitudinal planes on opposite sides of said frame and having rim flanges receiving said gears, means slidably and rotatably connecting said elliptical wheels to said opposite sides of the frame, internal gear teeth on said rim flanges meshingly engageable by said gears when said levers are rotated upwardly, respective idler rollers transversely journaled on the frame forwardly adjacent and engageable by said rim flanges when said gears are moved into meshing engagement with said internal gear teeth, said arms being of sufficient length to elevate the supporting wheels when the levers are rotated upwardly and to bring said rear supporting leg means into ground engagement, respective caster assemblies telescopically engaging said front supporting legs, and fluid pressure-operated means to extend said caster assemblies downwardly so that the seat frame may be levelled when the rear portion thereof is elevated on a step by rotating said elliptical wheels thereon.

7. A wheel chair comprising a seat frame having depending rear supporting leg means and a pair of depending front supporting legs, respective levers pivoted to opposite sides of said frame on aligned transverse axes, respective arms projecting from the pivoted ends of said levers, respective transverse shafts journaled in said arms, a supporting wheel secured on the outer end of each shaft, a pinion gear secured on the inner end of each shaft, respective elliptical wheels located in vertical longitudinal planes on opposite sides of said frame, each elliptical wheel comprising an elliptical main body provided with a rim flange, said main body having a longitudinal slot, transverse pivot bolt means on the sides of the seat frame extending through said slots and slidably and rotatably connecting the elliptical wheels to the respective sides of the seat frame, internal gear teeth on the rim flanges, said rim flanges receiving said gears and the internal gear teeth being meshingly engageable by said gears when said levers are rotated upwardly, respective idler rollers transversely journaled on the frame forwardly adjacent and engageable by said rim flanges when said gears are moved into meshing engagement with said internal gear teeth, said arms being of sufficient length to elevate the supporting wheels when the levers are rotated upwardly and to bring said rear supporting leg means into ground engagement, respective caster assemblies telescopically engaging said front supporting legs, and fluid pressure-operated means to extend said caster assemblies downwardly so that the seat frame may be levelled when the rear portion thereof is elevated on a step by rotating said elliptical wheels thereon.

8. A wheel chair comprising a seat frame having depending front supporting legs and supporting wheels connected to the seat frame at its opposite sides, ground-engaging means rotatably and slidably mounted on the frame adjacent said wheels to at times elevate the frame, respective caster assemblies associated with said front supporting legs, means telescopically connecting said caster assemblies to the front supporting legs, and means to at times telescopically extend said caster assemblies downwardly so that the seat frame may be levelled when its rear portion is either raised or lowered.

9. A wheel chair comprising a seat frame having depending front supporting legs and supporting wheels connected to the seat frame at its opposite sides, ground-engaging means rotatably and slidably mounted on the frame adjacent said wheels to at times elevate the frame, respective caster assemblies associated with said front supporting legs, means telescopically connecting said caster assemblies to the front supporting legs, and fluid pressure-operated means to at times telescopically extend said caster assemblies downwardly so that the seat frame may be levelled when the wheel chair is ascending or descending a flight of stairs.

10. A wheel chair comprising a seat frame having depending front supporting legs and supporting wheels connected to the seat frame at its opposite sides, ground-engaging means rotatably and slidably mounted on the frame adjacent said wheels to at times elevate the frame respective caster assemblies associated with said front supporting legs, means telescopically connecting said caster



assemblies to the front supporting legs, fluid pressure-operated means to at times move said caster assemblies downwardly so that the seat frame may be levelled when the wheel chair is ascending or descending a flight of stairs, a source of fluid pressure on the chair, and pendulum-actuated valve means connected between said source and said fluid pressure-operated means.

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