Jan. 25, 1966 P. P. WEYER 3,231,290

WHEEL CHAIR FOR REGULAR AND IRREGULAR SURFACE TRAVEL

Filed Dec. 31, 1962 5 Sheets-Sheet 1

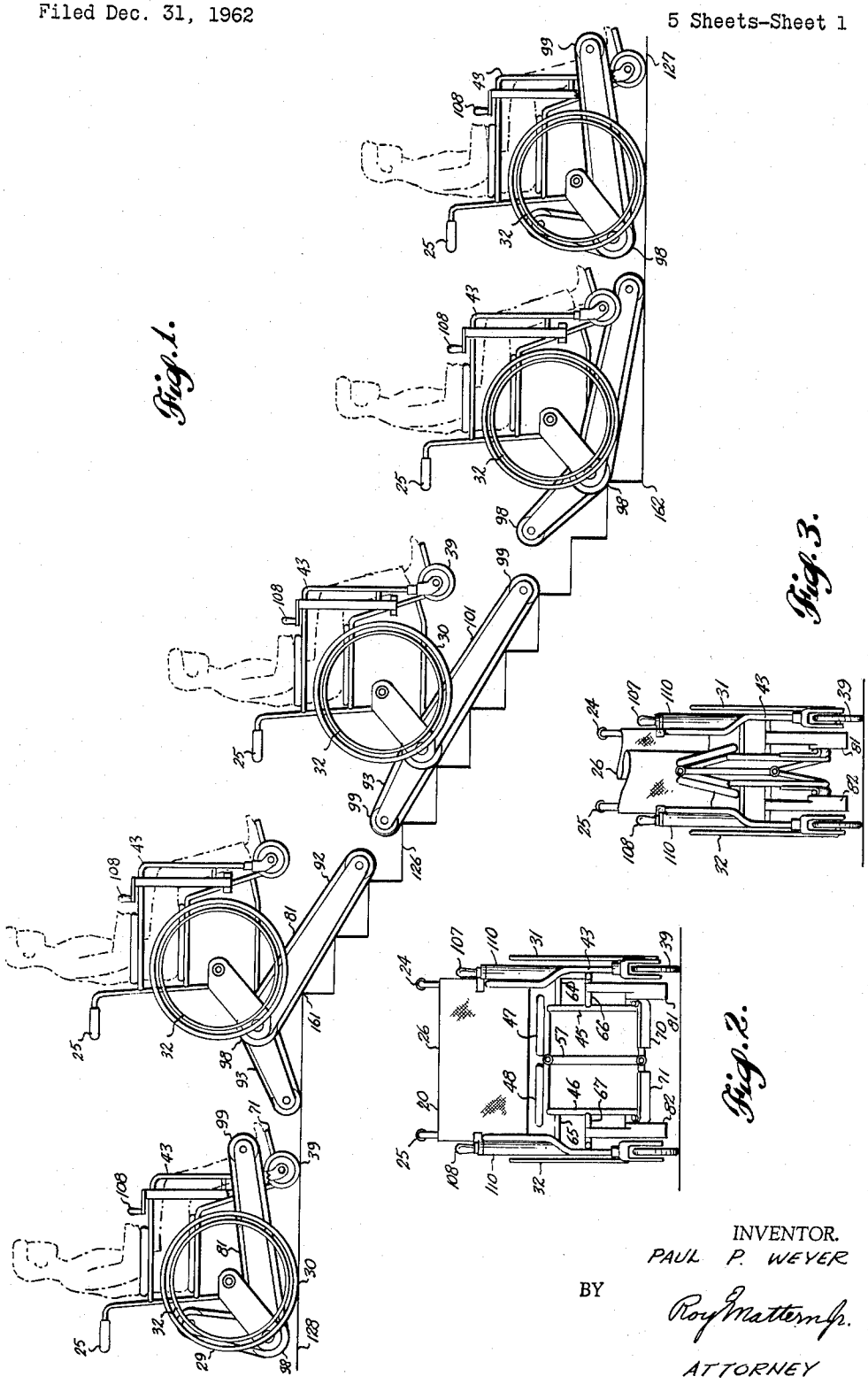

Fig. 1.



Fig. 3.



Fig. 2.

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WHEEL CHAIR FOR REGULAR AND IRREGULAR SURFACE TRAVEL

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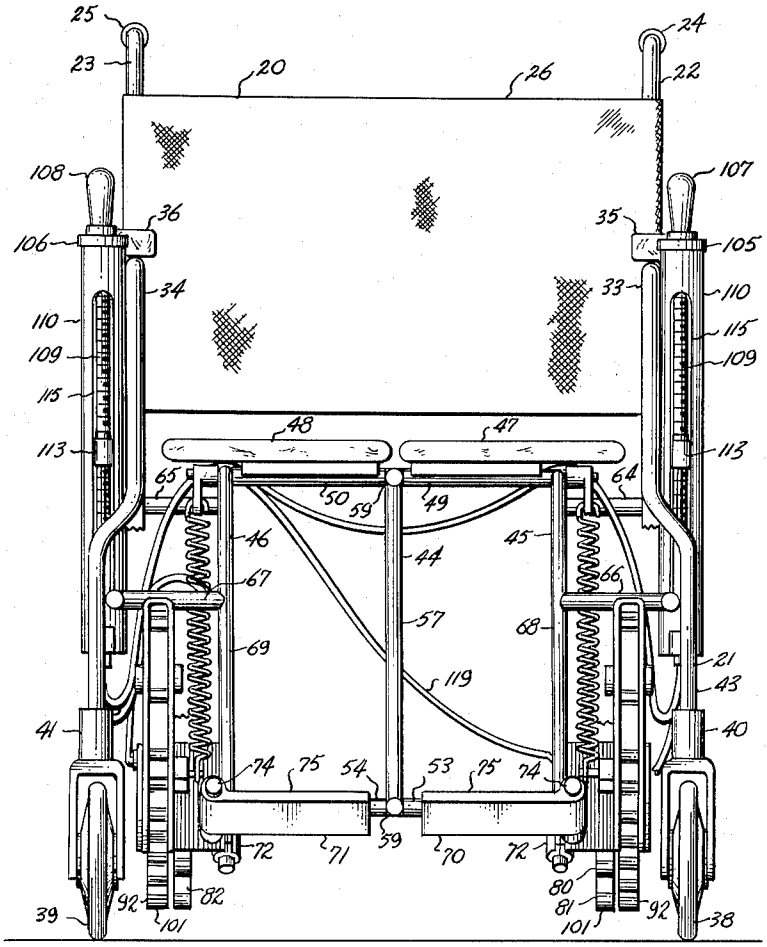


Fig. 4.

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WHEEL CHAIR FOR REGULAR AND IRREGULAR SURFACE TRAVEL

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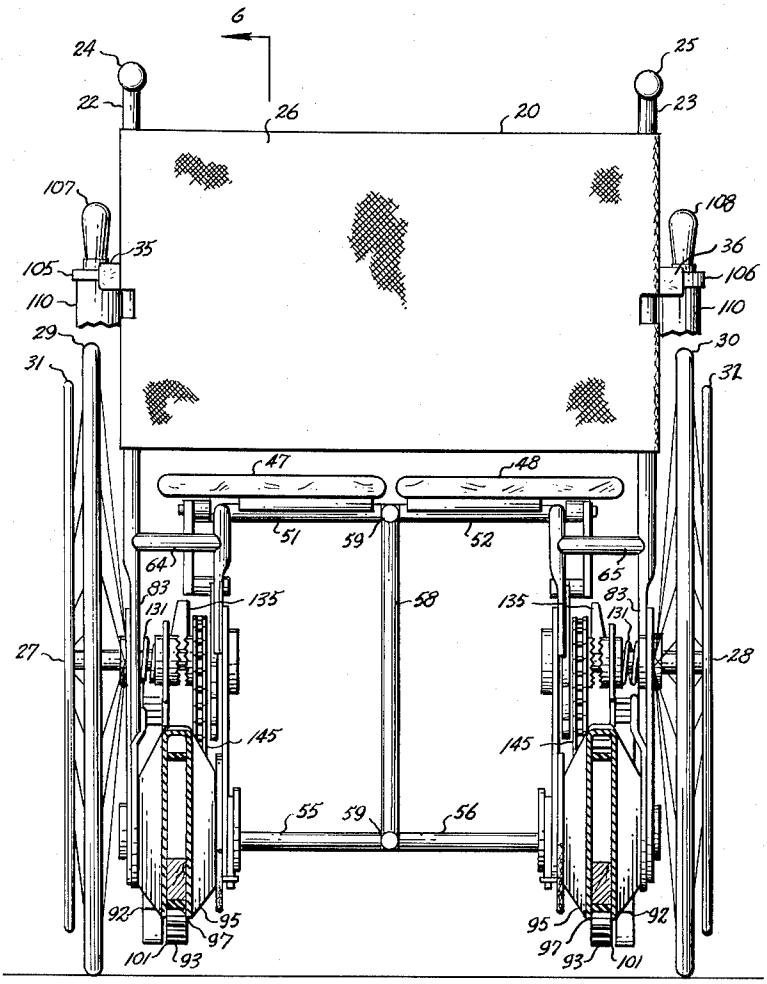


Fig. 5.

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WHEEL CHAIR FOR REGULAR AND IRREGULAR SURFACE TRAVEL

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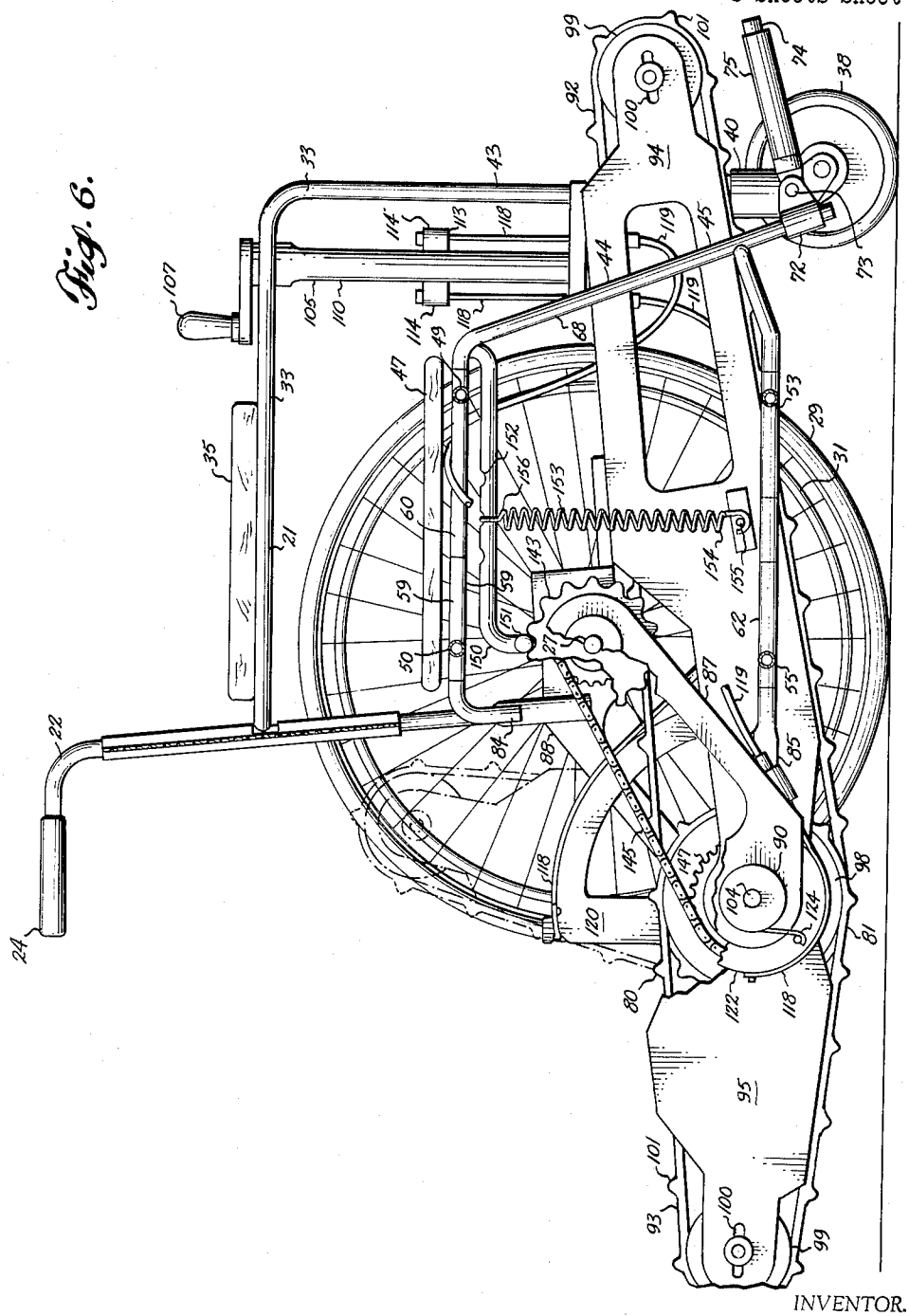
Fig. 6.



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WHEEL CHAIR FOR REGULAR AND IRREGULAR SURFACE TRAVEL

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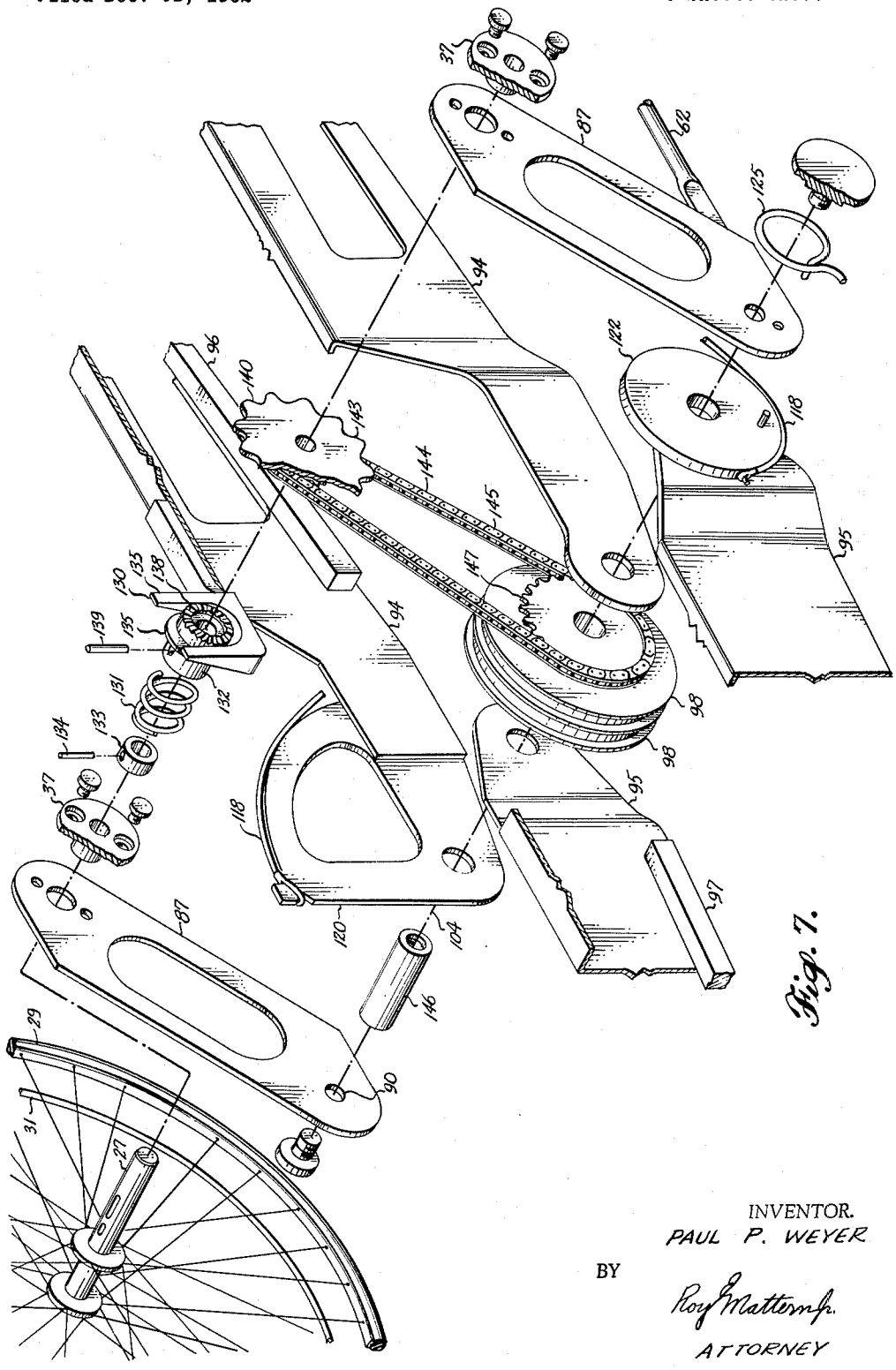


Fig. 7.

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3,231,290

# WHEEL CHAIR FOR REGULAR AND IRREGULAR SURFACE TRAVEL

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3 Claims. (Cl. 280—5.22)

The invention relates to vehicles and more particularly to wheel chair like vehicles operated by the occupant.

The purpose of the invention is to provide the occupant, generally an invalid, with a conveyance means which he can conveniently operate to carry himself about his living quarters, working place and/or community, and when traveling in another conveyance, such as a car or train, he can compact and carry his own personal conveyance means with him.

This invention, briefly described, comprises, in its preferred embodiment, essentially standard wheel chair components supplemented with irregular surface travel components carried in a retracted and non-powered position until needed and then moved and powered for contact with irregular surfaces.

The invention and its purpose will be understood more fully as the complete description of the preferred embodiment is read and references made to the drawings in which:

FIGURE 1 illustrates, schematically, how the wheel chair is moved up and down stairs;

FIGURES 2 and 3, show respectively and schematically, how the wheel chair is unfolded for use and folded for non-use storage or transporting;

FIGURE 4 is a front view of the preferred embodiment of the foldable wheel chair with some rearward portions not shown and others broken away;

FIGURE 5 is a rear view of the foldable wheel chair of FIGURE 4 with some forward portions not shown and others broken away;

FIGURE 6 is a sectional view of the foldable wheel chair taken along line 6—6 of FIGURE 5 with some portions being broken away; and

FIGURE 7 is an exploded view of some of the running gear and framing components on one side of the foldable wheel chair.

*Standard wheel chair components*

The foldable wheel chair illustrated in these figures preferably is constructed of standard or standard-like components. In this way users of wheel chairs will readily adapt themselves to this wheel chair vehicle, carrying over their past learned skills in propelling themselves in like manner over regular or substantially regular surface terrain. They will also feel comfortable in the like seating environment. From the production, maintenance and repair standpoints the utilization of as many standard components as possible greatly reduces the overall costs.

*Framing—occupant supports—wheels*

In the preferred embodiment, standard frame tubing and pivoted tubing sections are assembled, being changed only in form and location in certain respects to accommodate the added equipment required for over irregular surface travel. The framing **21** of the illustrated wheel chair **20** has two upright spaced back members **22, 23**. At their top, frame members **22, 23** terminate substantially above the seating area in handles **24, 25**, and supporting the foldable occupant supporting back material **26** which may be stitched, zipped or laced in place around the upright members **22, 23**. At their bottom frame members **22, 23** terminate below in the opposite direction around the axles **27, 28** of the large standard regular surface running wheels **29, 30**, both equipped with hand



gripping wheels **31, 32** of slightly less diameter and offset outwardly from the standard wheels **29, 30**, respectively, to accommodate the occupants hands used in propelling and guiding the illustrated wheel chair **20**.

Additional framing **21**, extends forwardly and horizontally from the upright back members **22, 23** forming arm rest supporting sections **33, 34** equipped with like arm rests **35, 36** and thereafter turning downward undergoing a slight offset to receive the forward smaller wheels **38, 39** through pivotal yoke connectors **40, 41**.

The framing just described may be considered the outer framing **43**. The inner framing **44** primarily is composed of two left and right frame sections **45, 46**, pivotally joined along the centerline of the wheel chair **20**. These sections **45, 46** support the seat sections **47, 48** on front and rear top cross frame members **49, 50, 51** and **52**, each composed of two lengths so the left and right inner frame sections and seat sections can be folded reducing the total width of the chair. Directly below the front and rear cross frame members **49, 50, 51, 52** are comparable bottom cross frame members **53, 54, 55, 56**. Their vertical spacing on the centerline is maintained by front and rear vertical frame lengths **57, 58** which are pivotally attached at their ends respectively to these top and bottom cross frame members. The left and right ends of all the cross frame members are pivotally connected through standard pivoting frame inserts **59** to left and right, top and bottom longitudinal frame sections **60, 61, 62, 63**. The top and bottom longitudinal frame sections **60, 62** on the left are also joined together by the diagonal forward extending frame member **68**. Likewise, the top and bottom longitudinal frame sections **61, 63** on the right are joined together by the diagonal forward extending frame member **69**.

At the lower ends of each diagonal frame member **68, 69** are sectional foot rest assemblies **70, 71**, each including a fitted frame sleeve **72**, pivotal connector **73**, partial rotative cylindrical support **74**, and foot rest section **75** fitted to support **74** which in turn is pivotally connected to the sleeve **72**. These left and right assemblies **70, 71** permit the angular and height adjustments of the foot rest sections to meet the comfort requirements of the passenger and also permit their upright positioning upon folding the wheel chair.

The outer framing **43** and inner framing **44** are maintained in a spaced relationship by top transverse rear interconnectors on both left and right sides, **64, 65**, and lower diagonal transverse front interconnectors on both left and right sides **66, 67**. The spacing of these outer and inner frames **43, 44** is governed by the transverse dimensional requirements of the mounted irregular surface travel running gear **80** arranged in left and right component assemblies **81, 82**.

*Support of irregular surface travel running gear*

The preferred arrangement construction and mounting of the irregular surface travel running gear **80**, arranged in left and right component assemblies **81** and **82**, is illustrated in FIGURES 4 through 7. Each running gear assembly is fitted within the spaces between the outer and inner framing **43, 44**.

Also each running gear assembly **81, 82** is supported above on its outer side and inner side on a respective large wheel axle **27** or **28** which is directly supported by both the outer and inner framing **43, 44** and more particularly at the lower end **83** of an upright framing section **22** or **23** of the outer frame **43** and the turned down rear end **84** of a top longitudinal frame section **60** or **61**, of the inner frame **44**.

In addition, each irregular surface running gear component assembly **81** or **82** is supported below on its inner

side by the rear end 85 of the bottom longitudinal frame section 62 or 63 of the inner framing 44. Optionally, the running gear assembly 81 or 82 could also be supported below on its outer side by a bottom longitudinal frame section (not shown) added to the outer framing 43.

The left and right irregular surface running gear component assemblies 81 and 82 provide their own framing between these high and low supporting places on the inner and outer frames. On each side of each assembly 81 or 82 are diagonal positioning braces 87 extending downwardly and to the rear. They are maintained in a fixed angular position by their positive attachments above, respectively, to the lower end 83 of the upright framing section 22 or 23 of the outer frame 43 and the turned down rear end 84 of the top longitudinal frame section 60 or 61 of the inner frame 44, and below, respectively, to the rear end 85 of the bottom longitudinal frame section 62 or 63 of the inner frame 44, and optionally to the rear end of a bottom longitudinal frame section (not shown) added to the outer framing 43.

These component assembly diagonal positioning braces 87, once installed, could also be said to be the completing members of the wheel chair framing 21 completing the structural circuits in the longitudinal planes of the respective right and left sections of the inner and outer frames. Carrying this analysis further from still a different viewpoint, these diagonal positioning braces 87 could also be said to be the completing members of the left and right running gear housing frames 88, 89, which thereafter are joined by the pivoting and folding frame sections previously described as pivoting and folding sections of the inner framing 44.

Whichever analysis be undertaken, the wheel chair framing 21 provides the foldable support for the conventional seating and regular surface running gear in a conventional arrangement and in addition establishes a lower rear mounting position 90 for irregular surface running gear.

*Endless belt tracks of irregular surface travel running gear*

For maintaining satisfactory supporting and propelling contact with irregular surfaces, such as stairs, endless belt track asemblies are arranged preferably in pivotal pairs 92 and 93, pivotal about the lower rear mounting position 90 and within each irregular surface travel running gear component assembly 81 or 82.

Each individual endless belt track assembly 92 or 93 comprises centered housing structure 94 or 95 including belt guide surfaces 96 or 97 and respective end belt turning wheels, of larger diameter 98 and of smaller diameter 99, rotatably mounted on the center housing structure 94 or 95. The smaller diameter belt turning wheels are mounted for lineal adjustment in slots 100 to acquire satisfactory belt track tension.

*Positioning of irregular surface travel running gear*

Selective pivotal movement of these endless belt track assemblies 92 and 93 about the common axis 104 of their larger belt turning wheels is preferably done by the occupant's hand operation of mechanical actuating assemblies 105, 106. These assemblies each include a hand operated revolving means such as a crank 107 or 108 which is directly attached to a threaded rod 109 supported in a slotted housing 110. The housing 110 in turn is secured to the outer framing 43, positioning the cranks 107 or 108 forward of the arm rests 35, 36.

Revolutions of threaded rod 109, depending on the clockwise or counter-clockwise direction of rotation causes up or down movement of a traveling nut 113, restrained from rotating by its integral lateral projections 114 extending forward and rearward through the slots 115. The threads 101 are formed to prevent initial axial forces from turning the nut 113. Attached to each projection 114 of each nut 113 is a control cable 118 which continues on eventually passing through protective and guiding flexible tubing 119, secured to the framing 21, until reaching a selected quadrant 120 or 121 attached to a forward pivotal endless belt track assembly 92 of both the left and right component assemblies 81, 82 or quadrant 122 or 123 attached to a rear pivotal endless belt track assembly 93 of both the left and right component assemblies 81, 82. These control cables 118 are interconnected between the nuts 113 and the quadrants 120, 121, 122, 123 so revolutions of crank 107 to be operated by the occupant's left hand will pivot the front pivotal endless belt track assemblies 92, 92 and revolutions of the crank 108 to be operated by the occupant's right hand will pivot the rear endless belt track assemblies 93, 93, or vice versa. Upon retraction, cables 118 release retraction spring forces of torsion spring 124 of track assemblies 93 and tension spring 153 of track assemblies 92. The extent of the hand craking to be done will depend on how irregular the surface is which is encountered by the occupant in his travel using this wheel chair. If the terrain to be encountered by the occupant is irregular in multiple directions, the controls could be made more selective by operating each pivotal endless belt track assembly independently (not shown).

*Transmission of power to irregular surface travel running gear*

Pivotal movement of the irregular surface travel running gear 80 is only undertaken when irregular surfaces are encountered such as the stairs 126 illustrated in FIGURE 1. While approaching or when leaving the stairs 126 on the higher 127 or lower 128 levels, the irregular surface travel running gear 80 is retracted and not powered. The occupant's hand forces turning the larger running wheels 29, 30, on their bearings 37, by contacting hand gripping wheels 31, 32, with the gear 80 retracted, result only in directly powering wheels 29, 30 which are in contact with the substantially regular surface.

When, however, the occupant operates the cranks 107, 108 pivoting the endless belt track assemblies 92, 93 of the left and right component assemblies 81, 82 of the irregular surface travel running gear 80, a clutch cam 130, attached to the centered housing structure 94, lowers with each pivoting front endless belt track assembly 92, as will be noted in FIGURE 7. Thereafter the associated spring 131 loaded clutch assembly 132, on the wheel axle 27 or 28, becomes effective, transmitting any power through its assembly which includes: a positioning sleeve 133; key 134; combination 135 of sleeve 136, follower cam surface flange 137 with laterally intermeshing gear ring 138 and key 139, and a combination 140 of opposed laterally intermeshing gear ring 141, with the upper chain sprocket wheel 142, key (not shown) and attached or integral ratchet wheel 143 of the chain drive 144. Thereafter the transmitted power is conveyed on as the upper sprocket wheel engages and guides the sprocket drive chain 145 along its closed path which is in alignment with the diagonal positioning braces 87. This chain 145 continues the transmission of any applied power for it also is engaged and passed around the lower chain sprocket wheel 147 which is keyed (not shown) to the shaft 148 on the common axis 104 of the larger belt turning wheels 98 and attached to or made integral with the side by side larger diameter belt track turning wheels 98 of both the front and rear pivotal endless belt track assemblies 92, 93.

With the clutch assembly 132 engaged, as the irregular surface travel running gear 80 pivots into contact with an irregular surface such as stair 126 of FIGURE 1, the occupant's hand power selectively applied to the hand gripping wheels 31, 32 causes rotation of the regular surface running wheels 29, 30, now raised above the irregular surface. These rotating wheels 29, 30 in turn transmit driving power through: axles 27, 28; clutch assembly 132; and chain drive 144 to move pivotal endless

belt track assemblies **92, 93** of the irregular surface travel runniing gear **80**.

*Safety features of irregular surface travel running gear*

At all times when the occupant is traveling in this wheel chair over regular surfaces the safety afforded him matches that available to him in a standard wheel chair. When the occupant travels over irregular, surfaces, the safety afforded him exceeds that available to him in a standard wheel chair, assuming that a standard wheel chair could be used in traveling over some irregular surfaces. Because of the almost universal use of this wheel chair the safety afforded throughout irregular surface travel is necessarily always maintained at the highest level possible to avoid any injury to the occupant caused by any malfunction of the wheel chair.

Whenever the wheel chair **20** is traveling over irregular surfaces, such as the stairs **126** shown in FIGURE 1, a motion restraining means **150** is energized. Such a means is a safety assembly **150** composed of the ratchet wheel **143** attached to or made integral with the upper chain sprocket wheel **142**, a follower ratchet roller **151**, a pivotal ratchet arm **152** supporting the ratchet roller **151** and pivotally secured to the inner framing **44**, and a tension spring **153** anchored at its lower end **154** by mounting pin **155** to the centered housing structure **94** of the front endless belt track assembly **92** and at its top end **156** by using selective tensioning detents **157, 158** and **159** spaced along the pivotal ratchet arm **152**.

This safety motion restraining assembly **150** is effective in holding the occupied wheel chair stationary on extensive irregular surfaces such as the stairs **126** of FIGURE 1 without the occupant holding the hand gripping wheels **31, 32**. Also, noted previously, non-movement is further insured because the occupant does not have to hold the cranks **107, 108** used to pivot the endless belt track assemblies **92, 93**. After these track assemblies **92, 93** are moved to any selected position by the occupant, the friction locked threads **101** are constantly effective in restraining all other forces until the cranks **107, 108** are subsequently and intentionally rotated by the occupant.

Therefore at any time during an otherwise dangerous ascent or descent the occupant using the wheel chair **20** with the irregular surface travel running gear **80** in position knows he may rest with safety while gaining strength to go on with his travels. Even on somewhat regular terrain the occupant may wish to transfer the loaded weight of the wheel chair to the irregular surface travel running gear **80** to insure non-motion of the wheel chair **20** while he rests.

*Operation scope of the wheel chair equipped with the irregular surface travel running gear*

As already indicated, wheel chair **20** provides the occupant, generally an invalid, with means to travel under his own power and guidance to many places formerly not accessible to him in his wheel chair. He travels over substantially regular surfaces with an efficiency comparable to travel in a standard wheel chair. Then when he encounters irregular surfaces, such as the stairs **126** of FIGURE 1, by his easy pivotal placement of the left and right component assemblies **81, 82** of the irregular surface travel running gear **80**, he proceeds up or down the irregular surface safely and conveniently. Only where the irregular surface changes rather abruptly, such as at the top **161** or bottom **162** of stairs **126**, must the occupant necessarily restrict his forward motion while positioning the irregular surface travel running gear **80**.

Other benefits result from astute placement of the pivotal endless belt track assemblies **92, 93**. As previously stated, the occupant may wish to transfer the loaded weight of the wheel chair to the irregular surface running gear **80** to insure non-motion of the wheel chair **20** during his rest period. He may also transfer the loading when he is using the wheel chair while working, perhaps increasing the angular positions of the endless belt track assemblies **92, 93** to raise his seating position at a work table. Moreover, while viewing an athletic contest, a show, or a parade, the occupant may increase his height substantially gaining a better sighting position. In addition, the occupant may increase his seating height prior to receiving the assistance of other persons who will aid him during his entry into another vehicle, such as a car.



This resume of the new transportation and positioning possiblities made available to the occupant is indicative only, because each user will find other possibilities, all making him more self sufficient than ever before.

I claim:

**1**. A rider controlled and propelled chair like vehicle for travel over both substantially level and obstruction like contours comprising:

(A) essentially standard components of a conventional wheel chair comprising:

(1) a foldable frame supporting a foldable

(a) seat;

(b) foot rest; and

(c) back rest; and

(2) a normal speed wheel assembly for travel over substantially level contours comprising:

(a) front swiveled guiding wheels pivotally mounted on the frame; and

(b) rear larger wheels equipped with a hand ring and rotatably mounted on a horizontal axis secured to the frame; and

(B) additional alternate use optional speed belt track assemblies for travel over irregular contours inclusive of stairs and other obstructions, comprising:

(1) a positioning sub framing secured to the foldable frame including axial supports and rotative axles both located below and behind the larger wheels at a slight distance above the plane of contact of the normal speed wheel assembly;

(2) forward belt track assemblies respectively rotatably positioned on the axial supports;

(3) rear belt track assemblies respectively rotatably positioned on the axial supports;

(4) connecting drive assemblies transmitting rotary motion between the rear larger wheels through cam and spring actuated clutches to both the forward and rear belt track assemblies; and

(5) rotary positioning mechanism for the belt track assemblies comprising:

(a) left and right hand crank translating nut and threaded guide rod assemblies secured to the foldable frame;

(b) quadrants attached to respective belt track assemblies along the axis of the sub framing axial supports; and

(c) fexible housed control cables having housings secured to both the foldable and sub framing with one set of control cables extending between one translating nut and the forward belt track quadrants and the other set of control cables extending between the opposite side translating nut and the rear belt track quadrants;

(6) adjustable restraining force ratchet assemblies interconnecting the foldable framing and the connecting drive assemblies transmitting rotary motion between the rear larger wheels and the belt track assemblies thereby maintaining a safe braking load during travel over irregular contours; and

(7) cams on the forward belt track assemblies to contact the spring engaged clutches of the connecting drive assemblies upon rotative re-

traction of the forward belt track assemblies thereby disengaging the entire alternate use optional speed belt track assemblies while traveling over substantially level contours.

2. A rider controlled and propelled chair-like vehicle as claimed in claim 1 wherein the forward and rear belt track assemblies comprise end to end channel belt track frames with end pulley wheels and continuous belts passing through the channels and around the end pulley wheels of the belt tracks.

3. A foldable wheel chair for travel over substantially all surfaces by utilizing both regular and irregular surface running gear alternately depending on the surfaces encountered, comprising:

(A) substantially all essential regular surface occupant hand-powered wheel chair components for seating and framing;

(B) regular surface running gear supported on the framing comprising main wheels equipped with hand power application auxiliary wheels, and leading wheels for both stability and steerability;

(C) irregular surface running gear including auxiliary framing supported on the framing, comprising endless belt track assemblies mounted for pivotal movement from retracted positions into respective forward and rearward irregular surface contact positions;

(D) adjustment controls on the frame for selectively positioning the endless belt track assemblies;

(E) alternate running gear drive engagement means mounted between the regular and irregular surface running gears to connect the irregular running gear to the hand powered main wheels only for travel over irregular surfaces; and



(F) adjustable motion restraining force assemblies interconnecting the foldable framing and the alternate running gear drive engagement means transmitting rotary motion between the main wheels and the belt track assemblies, comprising a ratchet wheel attached to the alternate running gear drive engagement means, a follower ratchet roller, a pivotal ratchet arm supporting the ratchet roller and pivotally secured to the wheel chair framing and a tension spring anchored at a lower end to the irregular surface running gear and at its upper end at a selective position of several positions along the pivotal ratchet arm, thereby maintaining a safe braking load during travel over irregular contours.


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