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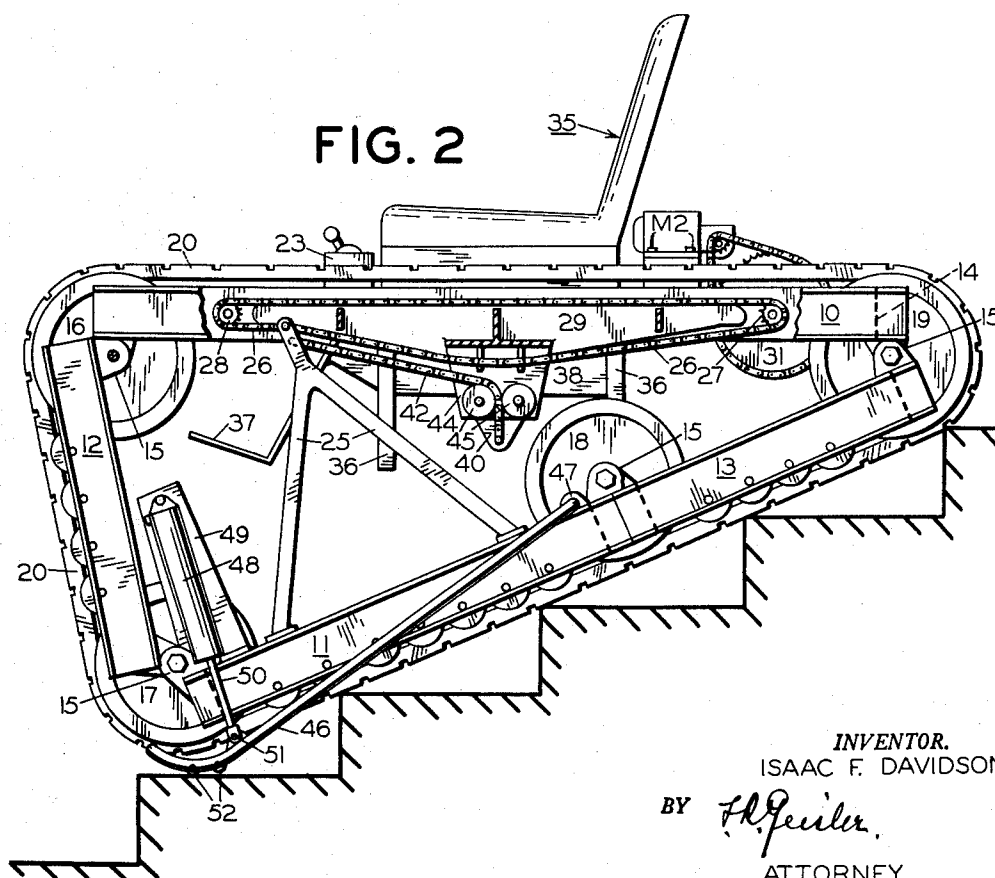
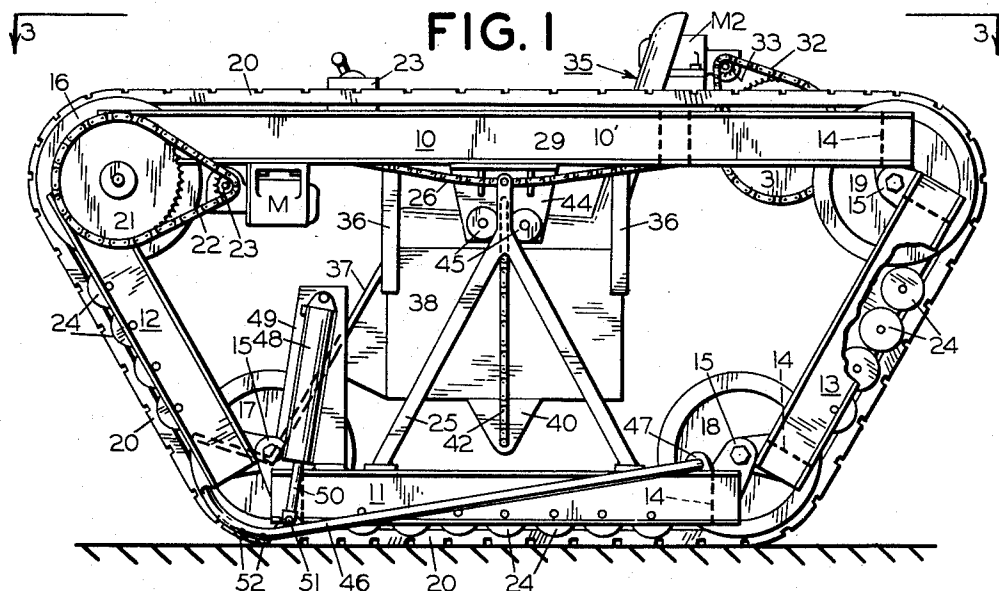
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ADJUSTABLE MOTOR-DRIVEN INVALID CHAIR WITH ENDLESS TRACKS

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3 Sheets-Sheet 1



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3 Sheets-Sheet 2

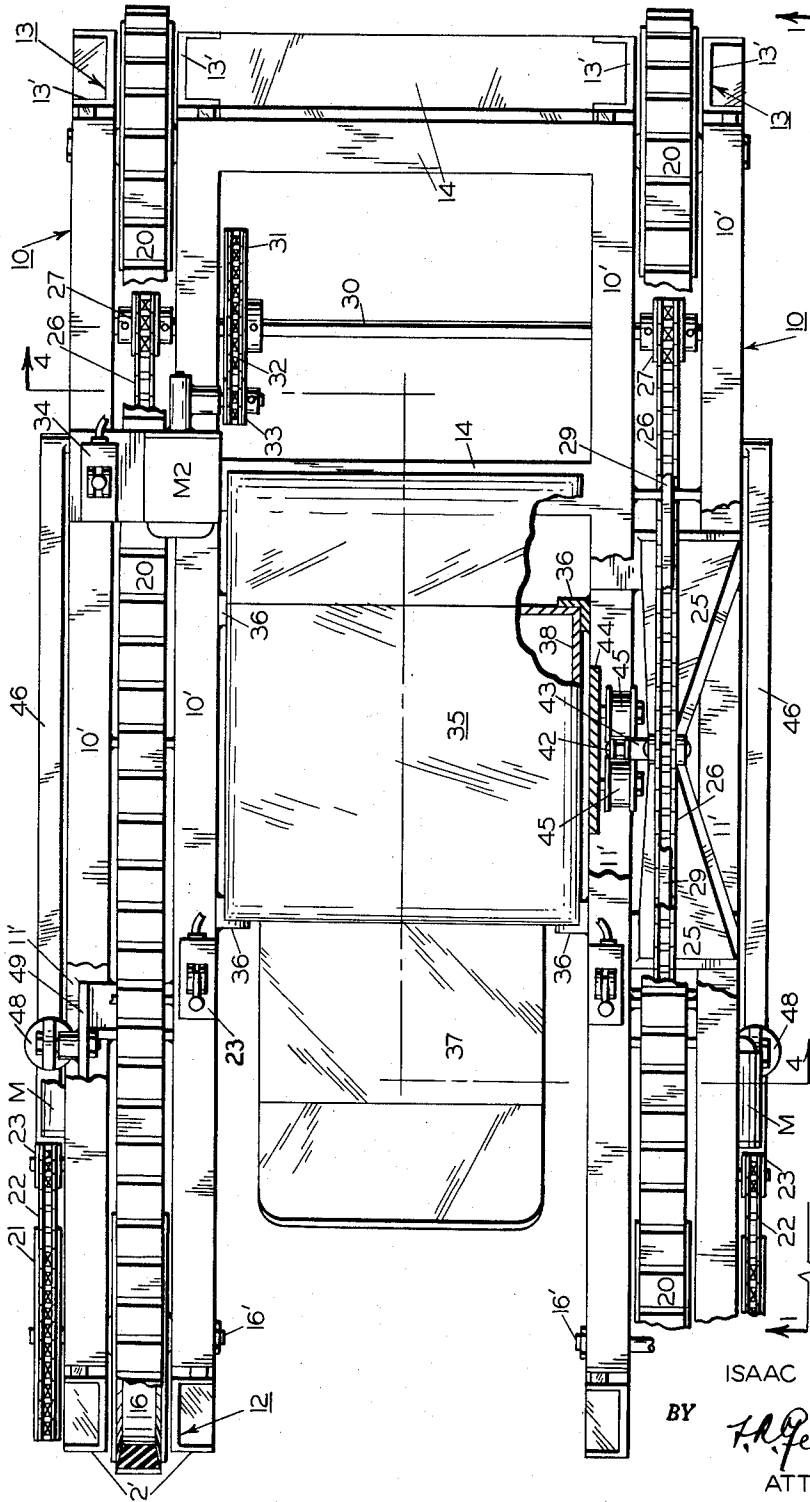


FIG. 3

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ADJUSTABLE MOTOR-DRIVEN INVALID CHAIR WITH ENDLESS TRACKS

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The present invention relates in general to motor-driven invalid chairs, and, more specifically, to such motor-driven chairs in which a pair of independently driven endless traction belts provide the means of propulsion of the chair over the ground.

An object of the invention is to provide an improved motor-driven invalid chair which can be used for ascending or descending a stairway or inclined surface as well as for travelling over horizontal surfaces.

A related object is to provide such a chair which can be readily changed into adjusted position more suitable for travel on an inclined plane than on a horizontal plane, and then changed back to normal position for travel on a horizontal plane.

A further object of the invention is to provide such an adjustable motor-driven invalid chair in which these adjustments of the chair can be made by the occupant of the chair without any inconvenience or exertion and without requiring the occupant to dismount from the chair.

Another object of the invention is to provide an improved invalid chair capable of travelling up or down a stairway, as well as for travelling on a horizontal surface, in which the chair or seat supporting the occupant will remain in upright and comfortable position during the travel of the chair regardless of whether the travel is up or down an inclined surface or stairway or along a horizontal surface.

An additional object of the invention is to provide an improved motor-driven invalid chair which will be carried along on two endless traction belts, the operation of which belts will be entirely under the control of the occupant, and which pair of traction belts will always operate in the same manner to propel the chair under the control of the occupant regardless of whether the chair is travelling on a horizontal surface or is adjusted for moving up or down an inclined surface or stairway.

A still further object of the invention is to provide an improved and adjustable invalid chair of the character above indicated in which cushioning means will protect the occupant from any extensive jolt or shock as the chair moves from a horizontal surface onto a downwardly inclined surface, or from an upwardly inclined surface onto a horizontal surface.

The manner in which these objects and other incidental advantages are attained with the device of the present invention, and the manner in which the device is constructed and operated, will be briefly described with reference to the accompanying drawings.

In the drawings:

FIG. 1 is a side elevation of the device showing the same in normal position for travel on a substantially level surface;

FIG. 2 is a corresponding side elevation showing the device in adjusted position for descending a stairway or inclined surface;

FIG. 3 is a top plan view of the device in the normal position of FIG. 1, taken on the line 3-3 of FIG. 1, but drawn to a larger scale;

FIG. 4 is a staggered sectional elevation taken on the line indicated at 4-4 in FIG. 3 and drawn to the same scale as FIG. 3;

FIG. 5 is a diagrammatic side elevation, drawn to a considerably smaller scale, illustrating the device in adjusted position and positioned preparatory to descend-

ing a stairway, this adjusted position of the device being the same as that shown more fully in FIG. 2; and

FIG. 6 is a similar diagrammatic side elevation, drawn to the same scale as FIG. 5, illustrating the device in the oppositely adjusted position and showing the device as having ascended stairway preparatory to arrival onto a level surface at the top of the stairway.

Referring briefly to FIGS. 1, 3 and 4, the device includes an adjustable frame structure having a pair of identical side frame assemblies extending in parallel substantially vertical planes and located at opposite sides respectively, with the corresponding main portions of the side assemblies firmly connected by cross members. Each side assembly constitutes a guideway for a driven endless traction belt. Since both side assemblies are the same it will suffice to describe one of them, thus the near side assembly as shown in FIG. 1.

Each side frame assembly is composed of four main frame portions which are hingedly connected respectively. Thus each side assembly has a top frame portion 10 (FIG. 1), a bottom frame portion 11, which is somewhat shorter in length than the top frame portion 10, a front frame portion 12, connected at its ends to the front ends of the top portion 10 and bottom 11 by hinge means, and a rear frame portion 13 similarly connected at its ends to the rear ends of the top portion 10 and bottom portion 11 respectively. The front and rear main frame portions 12 and 13 preferably are substantially the same length and thus when the device is in the normal position shown in FIG. 1 the four main frame portions of each side assembly form up not only a quadrilateral but also preferably an isosceles trapezoid.

Each of the four main portions 10, 11, 12, and 13 of each side assembly is formed of a pair of longitudinally-extending members, preferably comprising channel irons, rigidly held together in spaced position by suitable integral cross webs. Thus, as shown in FIG. 4, the bottom portion 11 of each side frame assembly is formed of the two channel irons 11', 11', which are rigidly secured together in spaced relationship; and, as shown in FIG. 3, each rear frame portion 13 is similarly formed of the two spaced channel irons 13', 13'; each front frame portion 12 is formed of the two spaced channel irons 12', 12'; and each of the top frame portions 10 is formed of the two spaced channel irons 10', 10'. The corresponding portions of the two side frame assemblies are rigidly secured together by cross bars or channel irons, one of which is shown at 14 in FIG. 4.

As previously mentioned, the main portions of each side frame assembly are hinged together respectively by suitably hinged connections, these hinged connections being indicated at 15 in FIGS. 1 and 2. The hinge pins for these hinged connections also serve as mounting shafts for the four main pulleys 16, 17, 18 and 19 in each side assembly, over which main pulleys an endless traction belt 20 moves in each side assembly. One of these four traction belt pulleys in each side assembly, thus the forward upper pulley 16, is driven, the other three pulleys being idlers. Suitable engaging elements are carried on the undersides of the traction belts and on the drive pulleys 16 to provide for positive driving of the traction belts. The shaft 16' in each of the side assemblies to which the driven pulley 16 is secured is extended outwardly from the side assembly and carries a drive sprocket 21 which is connected by a sprocket chain 22 with a driving pinion 22' on a motor M. Each of the two endless traction belts 20 is driven by a separate motor, each motor M being supported on the top portion 10 of the respective side frame assembly. The two motors M are supplied with power from a suitable storage battery (not shown) and separate manual controls for the two motors are located on a control box 23

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mounted on the top portion of one of the side assemblies, preferably in the location indicated in FIG. 3. A series of smaller pulleys 24 for supporting the endless traction belts 20 are mounted on each of the portions 11, 12, and 13 of the side frame assembly portions between the larger end pulleys.

An A-frame 25 extends upwardly from the bottom frame portion 11 in each side assembly, being rigidly connected to the bottom portion 11. An endless positioning chain 26 is mounted in the top portion 10 in each side assembly. This positioning chain passes around a drive sprocket 27 at one end of its course (FIG. 3) and around an idler sprocket 28 (FIG. 2) at the other end of its course. The positioning chain 26 also passes beneath a guide track 29 (FIGS. 2 and 4) secured within the top portion 10 of the side assembly. Preferably this guide track 29 has a downwardly bowed bottom edge which causes the lower throw of the positioning chain 26 to follow a slightly concave course.

The positioning chains 26 in the top portions of the two side assemblies are driven in unison and are so arranged as to be driven to a limited extent in either direction. The opposite pair of drive sprockets 27 (FIG. 3) for these two chains are secured in a common cross shaft 30 which also carries a drive sprocket wheel 31. The drive sprocket wheel 31 is connected by sprocket chain 32 with a pinion 33 of a reversible motor M2. Operation of this motor M2 is controlled manually from a control box 34.

The top of the A-frame 25 in each side assembly is connected to the bottom throw of the respective positioning chain 26 (FIGS. 1, 2 and 4). Thus movement of the positioning chains 26 will cause relative movement of the top ends of the A-frame 25 with respect to the top portions 10 of the side assemblies, such relative movement being the same in both side assemblies since the positioning chains 26 move in unison. However, due to the fact that each side frame assembly includes the four main articulated portions 10, 11, 12 and 13, it is obvious that movement of the pair of positioning chains 26 in one direction (thus, for example, clockwise as viewed in FIG. 1) will cause the side assemblies to change from the position shown in FIG. 1 to that shown in FIG. 2; while movement of the two positioning chains to sufficient extent in the opposite direction from their position in FIG. 1 will cause the side assemblies to assume the position indicated in FIGS. 5 and 6.

A seat assembly 35 is slidably mounted for limited up and down movement in two pairs of angle iron guide tracks 36 which are rigidly mounted in the two top portions 10 of the two side assemblies. These pair of guide tracks 36 are perpendicular to the top portions 10 and consequently the four guide tracks are parallel. The seat assembly includes a main seat portion with a back rest and a foot rest 37. A pair of side plates 38 extend down below the main seat portion on opposite sides, these side plates being slidable in the pairs of guide tracks 36. The two side plates 38 are connected by a cross plate 39.

A bracket 40 is secured to the bottom of each side plate 38 and carries an outwardly-extending lug 41 (one of which is shown in FIG. 4). The bottom end of a chair-supporting chain 42 is attached to the lug 41 in each of the side assemblies. The top end of each of these chair-supporting chains 42 is similarly secured to an inwardly-extending lug 43 secured to the top portion of each A-frame 25.

A pair of spaced pulleys 45 are mounted on a supporting plate 44 in each side assembly. This supporting plate is rigidly secured to and extends downwardly from the top portion 10, and is located centrally between the corresponding pair of chair guideways 36. The chair-supporting chain 42 passes between the pair of spaced pulleys 44. When the device is in the normal position illustrated in FIGS. 1, 3 and 4, the lug 43 on each A-frame 25, to which the top end of the chain 42 is secured in each side assembly, will be located directly above the space between the

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two pulleys of the corresponding pair of pulleys 45. However, when the tops of the two A-frames 25 are moved with respect to the top portions 10 of the side assemblies, the chair-supporting chains 42 will be pulled over one or the other of the two pulleys in each pair of pulleys 45. For example, when the top of each A-frame is moved from the relative position shown in FIG. 1 to that shown in FIG. 2, the chair-supporting chains 42 will be pulled over the left pulley in each pair of pulleys 45 (as viewed in these figures), and when the top of each A-frame is moved relatively to the full extent of the opposite direction the chains 42 will be pulled over the other pulley in each pair respectively.

The relative movement of the top ends of the pair of A-frames with respect to the top portions 10 to the full extent in one direction (such movement being caused by the operation of the endless sprocket chains 26 driven in unison by the motor M2) will cause the four main portions of each side frame assembly to move substantially into the form of a triangle, as shown in FIGS. 2 and 5. This is the form into which the occupant of the device adjusts the side frames when the device is to be used for descending a stairway or inclined plane. When the bottom of the stairway or inclined plane is reached the occupant of the device brings the chair back into the normal position illustrated in FIG. 1 by operating the motor M2 sufficiently in the reverse direction. Furthermore, when the occupant of the device desires to ascend a stairway or incline the motor M2 is operated further in the reverse direction, which, as will now be apparent, causes the side frames to be brought into the other substantially triangular position illustrated in FIG. 6.

It will be further noted that when the device is adjusted from the normal position of FIG. 1 either to the position illustrated by FIGS. 2 or 5, or to the position illustrated by FIG. 6, and thus in position either for descending or for ascending a stairway or incline, the seat assembly 35 will be raised by the resulting movement of the chair-supporting chains 42. The reason for having the chair assembly raised under such conditions is to prevent engagement by any part of the chair assembly (such as the bottom ends of the side plates 38 or the foot rest 37) with the surface of the stairway or inclined plane when the device is adjusted into either of these two adjusted positions as described. On the other hand, when the device is in the normal position of FIG. 1 it is desirable to have the chair assembly carried at as low a position as possible in order that the occupant of the device may get into or off of the chair seat with the least inconvenience and effort.

When the device has been adjusted to the proper position for descending a stairway (as shown in FIG. 5) the movement of the device from the level surface at the top of the stairway onto the stairway would ordinarily result in a sudden and undesirable impact or thump as the device tipped forwardly onto the stairway. Similarly when the device, in the adjusted position of FIG. 6 in the process of climbing a stairway, would reach the level surface at the top of the stairway there would ordinarily be a similar undesirable impact or thump as the device tipped forwardly onto the level surface. In order to cushion the shock which would occur under each of these conditions a pair of identical cushioning runners 46 are hingedly mounted on the outside of the bottom portions 11 of the two side assemblies respectively, the runner 46 on one side only being shown in the drawings.

The pair of runners 46 are hinged at their rear ends and extend forwardly beyond the forward ends of the bottom portions 11 of the side assemblies. The forward ends of these runners are curved upwardly, as shown, so as to facilitate their passage over the surfaces which they contact, and also preferably the forward ends carry small rollers 52 to reduce further the frictional engagement of these ends with the contacted surfaces over which the device passes. The forward end of each runner 46 is pivotally connected at 51 to the bottom end of a piston rod 50

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carried by a piston in an air cylinder 48. Each air cylinder 48 is pivotally supported on an upstanding mounting bracket 49 carried by the forward end of the bottom portion 11 in the respective side assembly. The piston in each of these air cylinders 48 carries a one-way valve which allows the piston to drop down freely in its air cylinder but permits the piston to be thrust upwardly only in a slow cushioning motion.

The front ends of the runners 46 rest or ride on the ground surface in the normal travel of the device. When the device is in the position illustrated in FIG. 5, and thus at the point of starting to go down an incline, the runners 46 drop down under their own weight below the front ends of the lower portions 11 of the side assemblies. The one-way valve in the piston in each air cylinder enables the runners to drop down quickly. However when the device then starts to tip forwardly the upward pressure on the runners and pistons compresses the air in the cylinders 48 and thus cushions the impact of the lower portions of the side assemblies with the inclined surface or stairway.

The same cushioning effect takes place when the device has reached the top of an incline and the front end of the lower portions 11 are about to move downwardly onto the level surface, as apparent from FIG. 6.

Thus the occupant of the device can, without dismounting from the seat in the device, adjust the device for travel up or down an incline or stairway. The travel of the device from a horizontal surface onto a downwardly inclined surface or from an upwardly inclined surface onto a horizontal surface will not be accompanied by any extensive jolt or shock, since this change of position of the lower portions 11 of the two side frame assemblies is cushioned by the shock absorbing runners. The seat assembly supporting the occupant remains upright when the device is ascending or descending an incline, as well as when the device is travelling on level ground, which adds to the comfort of the occupant of the device. Furthermore the adjustment of the device for upgrade or downgrade travel does not interfere with the propulsion means or operation of the pair of endless traction belts since these are at all times operable under the control of the occupant of the device regardless of whether the device is in normal or adjusted positions.

I claim:

1. In a motor-driven invalid chair having a pair of endless traction belts at opposite sides and motor means for driving the traction belts, a pair of identical articulated side frame assemblies at opposite sides respectively, the pair of traction belts passing around said side frame assemblies respectively, each of said side frame assemblies consisting of rigid top, bottom, forward and rear main portions hingedly connected at their ends respectively and normally positioned in trapezoidal formation, cross members rigidly connecting the corresponding main portions of said side frame assemblies together respectively, an element secured to said bottom main portion in each side frame assembly, an adjustable element carried by said top main portion in each assembly and connected with the top of said first mentioned element, said adjustable elements so arranged as to cause the tops of said first mentioned elements to be moved longitudinally along said top main portions in said assemblies when said adjustable elements are operated, means for operating said adjustable elements in unison, and manual control means for said operating means, the arrangement of said first mentioned elements and said adjustable elements in said side frame assemblies being such that when the tops of said first mentioned elements are held in normal neutral position by said adjustable elements said bottom and top main portions in said side frame assemblies will be parallel, but when said tops of said first mentioned elements are moved from neutral position by said adjustable elements, said bottom main portions will be moved into non-parallel

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position with respect to said top main portions respectively.

2. In an adjustable motor-driven invalid chair, a pair of identical articulated side frame assemblies at opposite sides respectively, a pair of endless traction belts passing around said side frame assemblies respectively, means for driving each of said traction belts, each of said side frame assemblies formed of a plurality of main portions respectively hinged together and including top and bottom main portions, cross members rigidly connecting the corresponding main portions of said side frame assemblies together respectively, an element extending upwardly from said bottom main portion in each side frame assembly and rigidly connected to the bottom main portion, an adjustable element carried by each of said top main portions in said side frame assemblies and cooperating with the first mentioned element in the respective side frame assembly for controlling and adjusting the relative position of said top main portion with respect to said bottom main portion in each side frame assembly, means for adjusting said adjustable elements in unison, and a seat assembly positioned between and supported by said side frame assemblies.

3. In an adjustable motor-driven invalid chair, a pair of identical articulated side frame assemblies at opposite sides respectively, a pair of endless traction belts passing around said side frame assemblies, motor means for driving each of said traction belts, each of said side frame assemblies consisting of top, bottom, forward and rear main portions hingedly connected at their ends respectively, cross members rigidly connecting the corresponding main portions of said side frame assemblies together respectively, adjusting means for said side frame assemblies, said adjusting means normally maintaining said main portions at each of said side frame assemblies in trapezoidal formation with said top and said bottom main portions in each of said side frame assemblies substantially parallel when said chair is used on substantially level surfaces, but capable of adjusting said top and said bottom main portions into non-parallel position when said chair is to be used on inclines, manually controlled means for controlling and operating said adjusting means, a seat assembly positioned between and supported by said side frame assemblies, guide tracks for said seat assembly secured to said top main portions of said side frame assemblies, said seat assembly slidable up and down in said guide tracks and seat adjusting means connected with said bottom main portions and said top main portions of said side frame assemblies and with said seat assembly automatically changing the elevation of said seat assembly according to the relative positioning of said top main portions of said side frame assemblies with respect to said bottom main portions.

4. In an adjustable motor-driven invalid chair, a pair of identical articulated side frame assemblies at opposite sides respectively, a pair of endless traction belts passing around said side frame assemblies respectively, means for driving each of said traction belts, each of said side frame assemblies formed of a plurality of main portions respectively hinged together and including top and bottom main portions, cross members rigidly connecting the corresponding main portions of said side frame assemblies together respectively, an element extending upwardly from said bottom main portion in each side frame assembly and rigidly connected to the bottom main portion, an adjustable element carried by each of said top main portions in said side frame assemblies and cooperating with said first mentioned element in the respective side frame assembly for controlling and adjusting the relative positioning of said top main portion with respect to said bottom main portion in each side frame assembly, means for adjusting said adjustable elements in unison, a seat assembly positioned between said side frame assemblies, guide tracks for said seat assembly secured to said top main portions of said side frame assemblies, said seat

assembly slidable up and down in said guide tracks, seat adjusting means connected with said bottom main portions and said top main portions of said side frame assemblies and with said seat assembly automatically changing the elevation of said seat assembly according to the relative positioning of said top main portions of said side frame assemblies with respect to said bottom main portions, and a pair of shock-reducing runners mounted on said bottom main portions of said side frame assemblies respectively and having cushioning connection with said bottom main portions.

5. An adjustable motor-driven invalid chair including a pair of identical articulated side frame assemblies at opposite sides respectively, a pair of endless traction belts passing around said side frame assemblies, motor means for driving each of said traction belts, each of said side frame assemblies consisting of a top, bottom, forward and rear main portion hingedly connected at their ends respectively, cross members rigidly connecting the corresponding portions of said side frame assemblies together respectively, adjusting means for normally maintaining said main portions in each of said side frame assemblies in trapezoidal formation with said top and said bottom main portions in each of said side frame assemblies substantially parallel when said chair is used on substantially level surfaces and for adjusting said top and bottom main portions into non-parallel position when said chair is used on inclines, manually controlled means for controlling and operating said adjusting means, a seat as-

sembly positioned between said side frame assemblies, guide tracks for said seat assembly secured to said top main portions of said side frame assemblies, said seat assembly slidable up and down in said guide tracks, cooperating seat adjusting means connected with said bottom main portions and said top main portions of said side frame assemblies and with said seat assembly and changing the elevation of said seat assembly according to the relative positioning of said top main portions of said side frame assemblies with respect to said bottom main portions, a pair of shock-reducing runners mounted on said bottom main portions of said side frame assemblies respectively, said runners pivotally mounted at their rear ends on said bottom main portions for limited up and down movement with respect to said bottom main portions, and cushioning means connected with the forward ends of said runners and with said bottom main portions for cushioning upward movement of said forward ends of said runners with respect to said bottom main portions.

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