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(54) Title: PROPULSION UNIT FOR A WHEELCHAIR

(57) **Abrégé(suite)/Abstract(continued):**

thereto, a right and a left power driven wheels operably and distinctly coupled to the at least one motor, the right and left power driven wheels being characterized by a respective first and second rotation speeds, the at least one motor being coupled with at least one battery and a controller for controlling the first and second rotation speeds; and a mounting structure having at least one first mounting element carried by the propulsion unit frame and at least one second mounting element carried by the wheelchair, the at least one first and second mounting elements being adapted to securably and releasably mate into one another form mounting the propulsion unit to the wheelchair frame, the power driven wheels being located between the wheelchair wheels when the propulsion unit is mounted to the wheelchair.

ABSTRACT OF THE DISCLOSURE

The invention relates to a kit providing a wheelchair adaptable in one of a hand powered mode and a motorized mode. The kit comprises: a wheelchair frame with two wheels rotatably mounted; a propulsion unit frame having at least one motor mounted thereto, a right and a left power driven wheels operably and distinctly coupled to the at least one motor, the right and left power driven wheels being characterized by a respective first and second rotation speeds, the at least one motor being coupled with at least one battery and a controller for controlling the first and second rotation speeds; and a mounting structure having at least one first mounting element carried by the propulsion unit frame and at least one second mounting element carried by the wheelchair, the at least one first and second mounting elements being adapted to securably and releasably mate into one another form mounting the propulsion unit to the wheelchair frame, the power driven wheels being located between the wheelchair wheels when the propulsion unit is mounted to the wheelchair.

PROPULSION UNIT FOR A WHEELCHAIR**BACKGROUND OF THE INVENTION****(a) Field of the Invention**

5 The present invention relates to a kit for converting a hand-powered wheelchair into a motorized wheelchair and, more specifically, to a portable propulsion unit to be inserted under a wheelchair to convert, in a temporary manner, the latter into a motorized wheelchair.

(b) Description of Prior Art

10 The choice of a wheelchair depends on the nature of the user's handicap, on the activities that he or she practices, and on the user's environment. Different kinds of wheelchairs have been designed to satisfy the user's needs. Wheelchairs can be classified in two main categories: hand-powered and motorized wheelchairs. Hand-powered wheelchairs are suitable for those who usually do few activities outside their home and/or for healthy users whereas
15 motorized wheelchairs are well-suited for those who travel long distances or for severely handicapped persons since they require no physical effort. Motorized wheelchairs are usually bulky and difficult to use in confined space. Furthermore, they are expensive and difficult to transport since they usually cannot be collapsed. Thus, hand-powered wheelchairs are the most widely
20 used. Moreover, as time goes on, the user's needs may change and he/she may sporadically or permanently require a motorized wheelchair. Since it may not be easy to adapt to a new wheelchair, there is thus a need for a wheelchair which can be hand-powered or motorized depending on the user's current needs.

25 Several solutions exist worldwide to transform a hand-powered wheelchair into a motorized one. Friction drive systems which include frictional rollers driven by one or two motors that rotate in contact with the rear drive wheels of the wheelchair may be used. However, the efficiency of these systems is considerably reduced under wet conditions. These systems are usually not easy

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to install on and remove from the wheelchair. Moreover, they cannot be easily adapted to different kinds and sizes of wheelchairs.

Another solution is to convert a hand-powered wheelchair into a motorized one by replacing the rear wheels with smaller, motor-driven wheels. However, once
5 converted, it does not provide a manual mode. Moreover, since the motor-driven wheels are smaller than the hand-powered wheels, the wheelchair cannot be driven in the same way. Therefore, the user must adapt his/her driving technique between the motorized and the manual modes.

Another solution consists in wheelchair drive units (WDU) that provide
10 electrically powered 'pushing assistance' for most common domestic types of wheelchairs. These WDU have only one motor and one drive wheel. Thus, they require an attendant's help to push and direct the wheelchair. It is thus impossible for a user to drive alone his/her wheelchair.

Another solution consists in locating the electric motors in the hubs of the
15 wheelchair drive wheels. US patent No. 5,350,032 to Smith discloses a kit for power conversion of a hand-powered wheelchair wherein one or more power hubs are integrated into the rear drive wheels of the wheelchair to effect propulsion by means of a simple controller mounted to the armrest of the chair. However, since the motors cannot be easily removed from the wheelchair, the
20 user has to carry their weight at all times, even in hand-powered mode.

US patents No. 4,767,864 and No. 4,386,672 disclose detachable electric drive units mountable proximate to the front portion of the wheelchair and controlled by the user. However, these devices severely hamper the user's entry and exit of the wheelchair when the drive unit is installed.

25 All existing solutions found on the market have at least one major disadvantage. Some of them are dedicated to only one wheelchair configuration, others hamper the user's accessibility to the wheelchair, require permanent transformation of the wheelchair, can only be controlled in one direction, require strength and dexterity for mounting the kit to the wheelchair or require an
30 attendant for pushing and controlling the wheelchair.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a propulsion unit for hand-powered wheelchairs which is capable of being mounted to and removed from a hand-operated wheelchair, and is easily adapted to any type of wheelchairs.

- 5 One aspect of the invention provides a propulsion unit adapted to be removably mounted to a wheelchair having a frame and wheels rotatably mounted thereto. The propulsion unit comprises: a propulsion unit frame adapted to be removably secured to the wheelchair, the propulsion unit frame having at least a first and a second power driven wheels rotatably mounted to the propulsion unit frame, the
10 power driven wheels being mounted between the wheelchair wheels; at least one motor operatively connected to the at least two power driven wheels to distinctly provide energy thereto, the first and second power driven wheels having a respective first and second rotation speeds; at least one portable energy source coupled to the at least one motor; and at least one controller
15 operatively connected to the at least one motor for controlling the first and second rotation speeds of the first and second power driven wheels.

- Another aspect of the invention provides a kit for motorizing a wheelchair having a frame and wheels mounted thereto. The kit comprises: a power drive assembly having a frame with two power driven wheels adapted to be rotatably
20 mounted thereto, each of the power driven wheels adapted to be operatively connected to at least one motor, the motors adapted to be coupled to at least one energy source and to at least one controller controlling the rotation of the power driven wheels; and a securing assembly for fastening the power drive assembly to the wheelchair, the securing assembly having at least a male
25 member and a female member, the at least one male and female members adapted to be mounted to a respective one of the wheelchair frame and the power drive assembly frame and being adapted to removably mate with one another when the power drive assembly mounted to the wheelchair, the power driven wheels being located between the wheelchair wheels when the
30 propulsion unit is mounted to the wheelchair.

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A further aspect of the invention provides a kit providing a wheelchair adaptable in one of a hand powered mode and a motorized mode. The kit comprises: a wheelchair frame with two wheels rotatably mounted; a propulsion unit frame having at least one motor mounted thereto, a right and a left power driven
5 wheels operably and distinctly coupled to the at least one motor, the right and left power driven wheels being characterized by a respective first and second rotation speeds, the at least one motor being coupled with at least one battery and a controller for controlling the first and second rotation speeds; and a mounting structure having at least one first mounting element carried by the
10 propulsion unit frame and at least one second mounting element carried by the wheelchair, the at least one first and second mounting elements being adapted to securably and releasably mate into one another form mounting the propulsion unit to the wheelchair frame, the power driven wheels being located between the wheelchair wheels when the propulsion unit is mounted to the wheelchair.

15 **BRIEF DESCRIPTION OF DRAWINGS**

Having thus generally described the nature of the invention, reference will now be made to the accompanying drawings, showing by way of illustration, two preferred embodiments thereof, and in which:

Figure 1 is a perspective view of a hand-powered wheelchair and a propulsion
20 unit in accordance with an embodiment of the present invention;

Figure 2 comprises FIGS. 2A and 2B and is an exploded perspective view of a kit including the propulsion unit and for converting the wheelchair into a motorized one an anchoring system for mounting the propulsion unit to the wheelchair in accordance with an embodiment of the present invention;

25 Figure 3 is an exploded perspective view of the propulsion unit in accordance with an embodiment of the present invention;

Figure 4 comprises FIGS. 4A to 4F and is a side elevation view of the propulsion unit being mounted to the wheelchair (FIGS. 4A to 4C) and of the

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anchoring system (FIGS. 4D to 4F) configuration during the mounting operation in accordance with an embodiment of the present invention; and

Figure 5 is a rear elevation view of the wheelchair having the propulsion unit mounted thereto in accordance with the invention, wherein the wheelchair is on
5 an uneven ground.

It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings and, more particularly to FIG. 1, it will be seen
10 that a conventional hand-powered wheelchair 20 has a wheelchair frame 26 and two wheelchair drive wheels 28 for supporting the frame 26 on the ground and allowing the displacement of the wheelchair thereon, a seat 30 mounted to the frame 26, two armrests 32, and two handle guides 34. The wheelchair 20 is built along a longitudinal axis 38.

15 The wheelchair frame 26 includes two collapsible vertical sections, parallel to one another, each having a lower longitudinal tube 40, an upper longitudinal tube 42, a vertical rear tube 44 (FIG. 5), a vertical middle tube 46, and a vertical front tube 48, all connected together in a general rectangular shape. The longitudinal tubes 40, 42 are parallel to the wheelchair longitudinal axis 38 and
20 spaced-apart using the vertical tubes 44, 46, 48. Both vertical sections are made collapsible by means of pivotable cross-braces 50 having a first end pivotally mounted to one vertical section and the opposite end pivotally mounted to the other vertical section. The cross-braces 50 are shown only in part in the drawings. Both wheelchair drive wheels 28 are rotatably mounted in a known
25 manner to the wheelchair frame 26 and have a rotation axis 52 at right angle with respect to the wheelchair longitudinal axis 38.

To convert the hand-powered wheelchair 20 into a motorized wheelchair, a portable propulsion unit 54 is inserted (FIG. 4) under the seat 30 between the

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wheelchair drive wheels 28 and fastened to the wheelchair frame 26, as will be described below in more detail.

Referring to FIGS. 1 and 2, it will be seen that the propulsion unit 54 includes a structural frame 56 which has a longitudinal axis 58 and a transversal axis 60.

5 Two power driven wheels 62 are rotatably mounted to the structural frame 56. Each power driven wheel 62 is operatively connected to a respective motor 64 (FIG. 2). The motors 64 are also mounted to the structural frame 56 between the two power driven wheels 62. Having a distinct motor 64 for each power driven wheel 62 allows to have a different rotation speed for each wheel 62, as

10 will be described in detail below. The propulsion unit 54 also includes a controller unit 66 for controlling, among others, the rotation speed of each power driven wheel 62. Two batteries 68 are securely disposed on the structural frame 56, above the motors 64. One skilled in the art will appreciate that the propulsion unit 54 can include one portable energy unit, such as the battery 68,

15 or more than one. Each battery 68 is operatively connected to one motor 64 for providing energy for the rotation of the power driven wheels 62. A first part 70 of an anchoring system is also mounted to the structural frame 56, on each lateral side of the structural frame 56, for anchoring the propulsion unit 54 to the wheelchair 20. The propulsion unit 54 also has a front caster wheel 72 mounted

20 frontwardly to the structural frame 56 to support in equilibrium the propulsion unit 54 when unfastened with the wheelchair 20. Each member of the propulsion unit 54 will be described more in detail below.

More specifically referring to FIG. 2, it will be seen that the structural frame 56 includes a tubing 78 having substantially an L-shape elevation profile with two

25 longitudinal sections 80 spaced apart by an upper and a lower transversal sections 82, 84. Referring now to FIG. 3, it will be seen that the upper and lower transversal sections 82, 84 (FIG. 2) are conceived in a manner such that the spacing between both longitudinal sections 80 can be modified in accordance with the wheelchair width.

30 The tubing 78 has four members 78a, 78b, 78c, and 78d. Members 78a, 78b have substantially a C-shape and each cover one of the longitudinal sections 80

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and a portion of the corresponding upper and lower transversal sections 82, 84. Members 78c, 78d have substantially a straight shape and cover respectively the upper and the lower transversal sections 82, 84 (FIG. 2). Lower member 78d has a double leg 85 extending midway thereof. The purpose of the double
5 leg 85 will be described more in detail below.

The ends of members 78a, 78b are positioned in the upper and lower transversal sections 82, 84 and include a plurality of fixing holes 86 along their length. Similarly, members 78c, 78d are respectively positioned at the upper and lower transversal sections 82, 84 (FIG. 2) and also include several fixing
10 holes 88 along their length. Members 78c, 78d are telescopically engaged over the ends of members 78a, 78b such as to modify the spacing between both longitudinal sections 80. Once the adequate width of the tubing 78 has been reached, fasteners (not shown) are inserted into two holes 86, 88 facing each other and having a similar diameter in such a manner that the fastener can
15 simultaneously extend through both holes 86, 88. The width of the tubing 78 is adjusted by inserting more or less of the ends of members 78a, 78b into members 78c, 78d. If the exact desired length is impossible to achieve, another adjustment mechanism is available as it will be detailed below. One skilled in the art will appreciate that the width adjustment mechanism of the structural
20 frame 56 can differ from the one described hereinabove.

Referring to FIG. 2, there is shown that the tubing 78 defines a handle 89. The handle position is preferably adjustable by modifying the length of the longitudinal sections 80. The extension system of members 78a, 78b can be similar to the one described above in relation to the width of the tubing, so no
25 specific description will be given here.

First part 70 of the anchoring system is mounted to the tubing 78 and includes two spacing members 90 mounted to a respective horizontal portion of the longitudinal sections 80 and two anchoring plates 92 mounted to the spacing members 90 and are conceived to matingly engage a second part 151 of the
30 anchoring system mounted to the wheelchair frame 26, as will be described more in detail below. Referring to FIG. 2B, it will be seen that the spacing

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member 90 has an inner concave face 94 that allows to matingly juxtapose spacing member 90 to longitudinal section 80 of the tubing 78.

Referring to FIG. 3, it will be seen that a shock absorber assembly 96 providing a smooth ride for the user and preserving the motorized wheelchair drive on
5 uneven ground (as shown on FIG. 5) is also preferably mounted to the structural frame 56.

The shock absorber assembly 96 includes a U-shape connector 98 having a base member 100, two arms 102 extending from the ends of the base member 100, a tubular connector 104, a tubing 106 having a substantially L-shape with a
10 vertical portion 106a and a horizontal portion 106b, and a shock absorber 108.

The U-shape connector 98 is centrally and pivotally mounted to the member 78d of the tubing 78 with fasteners or any other technique known by a person skilled in the art. The tubular connector 104 is mounted to U-shape connector 98 between both arms 102 in a manner such that the hollow portion of the
15 tubular connector 104 faces arm holes 110 whereby the U-shape connector 98 and the tubular connector 104 are secured together with a threaded rod and nut system (not shown) or any other method known by one skilled in the art.

The free end of the vertical portion 106a of the tubing 106 is welded to the tubular connector 104 midway thereof. The shock absorber 108, on the other
20 hand, has a first end fastened to the tubing 106 at the junction of the vertical and horizontal portions 106a, 106b. The opposite end of the shock absorber 108 is secured to the double leg 85 and to the front caster wheel 72.

The U-shape connector 98 is pivotally mounted to member 78d of the tubing 78. The propulsion unit 54 can compensate for the transversal disturbances on the
25 ground as shown in FIG. 5. The shock absorber 108 compensates for the vertical disturbances, providing more comfort to the wheelchair user.

The front caster wheel 72, which stabilizes the propulsion unit 54 when the latter is not fastened to the wheelchair 20, is rotatably mounted to the double leg 85 in a known manner at the free end thereof. One skilled in the art will

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appreciate that the propulsion unit 54 can include a stabilizing member which is different from a caster wheel 72, which can be several caster wheels 85 or which can be provided by any other known means. Preferably, the stabilizing member or the caster wheel 72 should not be in contact with the ground when
5 the propulsion unit 54 is mounted to the wheelchair 20, as shown in FIG. 4.

Referring to FIGS. 2 and 3, it will be seen that a plate 114 is mounted to the horizontal portion 106b of the tubing 106 proximate to its free end. The plate 114 has two sets of holes 116, parallel to and on both sides of the tubing 106, and supports the two power driven wheels 62 and the motors 64. The rotation
10 axis of the power driven wheels 62 is the same as the transversal axis 60 of the structural frame 56. Each power driven wheel 62 is operatively connected to a respective motor 64 in a manner such that the wheelchair 20 including the propulsion unit 54 mounted thereto can be completely controlled by the wheelchair user. When one motor 64 turns faster than the other one, the
15 wheelchair 20 including the propulsion unit 54 starts turning to the side of the slowest rotating power driven wheel 62. The motors 64 are operatively connected to the power driven wheels 62 through axle shafts 118.

The axle shafts 118 are mounted below the plate 114 by providing two threaded holes 120 on their upper surface and inserting fasteners simultaneously inside
20 the plate holes 116 and the threaded holes 120. The plurality of plate holes 116 enables to modify the longitudinal position of the power driven wheels 62 relative to the plate 114. The axle shafts 118 can also be mounted to the lower frame 76 by any other technique known to one skilled in the art.

The controller unit 66 is mounted to the members 78a, 78b, more specifically to
25 the longitudinal sections 80, and is operatively connected to the motors 64 and adapted to act thereon based on information inputted from a joystick device 122 (FIG. 1), such as the ones commonly used as video game accessories. The power transferred to the motors 64 from the batteries 68 is stopped by placing the controller unit 66 in neutral position, which can also provide a dynamic
30 breaking of the power driven wheels 62. In the event of power interruption or when the controller 66 is turned off, the power transfer assembly is arranged in

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a known manner to permit a degree of free wheeling so as to provide a hand-powered operation of the wheelchair 20. The batteries 68 are held together by means of a handle 124 and are disposed over the plate 114, as shown on FIG. 1.

5 Referring back to FIG. 2, the joystick device 122, which is preferably mounted in known manner on one armrest 32 (FIG. 1) of the wheelchair 20, is operatively coupled to the controller unit 66. Accordingly, the user may easily control the operation and the direction of the wheelchair 20 from a seated position. The joystick device 122 is fixedly mounted to a mounting block 126, the later having
10 a male member 128 of a fastening mechanism such as one part of a seat belt buckle or any other quick-disconnect fastener known to one skilled in the art to mount the joystick 122 on the wheelchair armrests 32, the wheelchair handle guides 34 or on the propulsion unit 54 on which a corresponding female member 130 of the fastening device is mounted, as shown on FIG. 1. A plurality
15 of female members 130, meshing with the male member 128, can be provided at several locations simultaneously. For example, the female member 130 can be provided on both the wheelchair armrests 32 and/or both handle guides 34 to easily adapt the wheelchair 20 to both left and right handed users and/or attendants. On the propulsion unit 54, as illustrated in FIG. 1, the female
20 member 130 is also connected to controller unit 66. One skilled in the art will appreciate that the mounting block 126 can include a female member 130 while the propulsion unit and/or the wheelchair 20 can include one or a plurality of male members 128.

As shown in FIG. 2, the mounting block 126 also includes a power switch 132,
25 that is operatively connected to the controller unit 66, to start and stop the propulsion unit 54.

FIG. 2B shows that each anchoring plate 92 has an outer face 136, a locking hole (not shown) and a U-shape front extension 138 with an upper arm 140 and a lower arm 142 extending from a lower edge 144 of the anchoring plate 92.
30 The U-shape front extension 138 defines a localization groove 145 and the

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junction of the lower edge 144 with the lower arm 142 defines a concave angle 146.

A spring-loaded pin 148 is inserted inside the locking hole and is adapted to slidably protrude from the outer face 136, as it will be described more in detail
5 below. The spring-loaded pin 148 is operatively connected to a coupling cable 150, or control lever. The connection between the coupling cable and the spring-loaded pin 148 is inserted into members 78a, 78b. When the coupling cable 150 is pulled, the spring-loaded pin 148 slides inside the anchoring plates 92 toward the spacing members 90, compressing a biasing member (not
10 shown) of the spring-loaded pin 148. When the coupling cable 150 is released, the biasing members decompress and push the spring-loaded pin 150 outside the anchoring plate 92, jutting out of the outer face 136. The coupling cable 150 operatively connects both spring-loaded pins 148 and is mounted to the tubing 78, proximate to the handle 89. The first part 70 of the anchoring system of the
15 propulsion unit 54 to the wheelchair 20 includes the anchoring plates 92 and the spring-loaded pins 148.

The second part 151 of the anchoring system of the propulsion unit 54 to the wheelchair 20 includes, for each vertical side of the wheelchair 20, one mounting bar 154, two rod fasteners 156 for securing the mounting bar 154 to
20 the wheelchair frame 26, and one mounting plate 158 mounted to the mounting bar 154 for engaging the first part 70 of the anchoring system to fasten the propulsion unit 54 to the wheelchair 20.

The rod fasteners 156 are mounted to the mounting bar 154 and have a circular portion 160 adapted to securely engage at least one of the longitudinal tubes
25 40, 42 and the vertical tubes 44, 46, 48 of the wheelchair frame 26. The position of the rod fasteners 156 on the mounting bar 154 is preferably vertically adjustable to modify the latter in accordance with the position of the tubes 40, 42, 44, 46, 48 on the wheelchair 20. Moreover, the size of the rod fasteners 156 are also preferably adjustable in accordance with the size of the tubes 40, 42, 44,
30 46, 48. For example, the size of the circular portion 160 can be widened to engage

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one of the tubes 40, 42, 44, 46, 48 and, thereafter, be tighten to secure the latter.

Referring to FIGS. 4D to 4F, there is shown that the mounting bar 154 has a longitudinal rail 162 extending on the face opposite to the face on which the rod fasteners 156 are mounted. The mounting plate 158 is slidably mounted to the rail 162 in a manner such that it is possible to adjust its height in accordance with the height of the first part 70 of the anchoring system mounted to the propulsion unit 54. Once the height of the mounting plate 158 has been adjusted on the mounting bar 154, it is secured thereon by methods known by those skilled in the art. The mounting plate 158 has an upper and a lower fixation pivots 164, 166 and a pin hole 168. Their purpose will be described below.

The fastening of the propulsion unit 54 to the wheelchair 20 is illustrated in FIG. 4. This is achieved first by pulling on the coupling cable 150 for sliding the spring-loaded pins 148 inside the anchoring plates 92 (FIG. 2). The propulsion unit 54 is then slid under the wheelchair frame 26 at the rear thereof and between the wheelchair drive wheels 28 in a manner such that the wheelchair longitudinal axis 38 remains parallel to the propulsion unit longitudinal axis 58. The propulsion unit 54 is slid until the upper fixation pivots 164 are fully engaged at the bottom of the localization grooves 145. Then, the handle 89 of the propulsion unit 54 is pushed down in the direction of arrow 170 to cause the lower fixation pivot 166 to slide toward and abut the concave angles 146. The coupling cable 150 is then released and the spring-loaded pins 161 slide inside the pin holes 168 of the mounting plates 158, thereby fastening the propulsion unit 57 to the wheelchair frame 26. After securely engaging the propulsion unit 31 to the wheelchair 20, the joystick device 122 is unfastened from the propulsion unit 54 and fastened to either the armrest 32, enabling the user to control the motorized wheelchair, or to handle guide 34, giving control of the wheelchair 20 to the attendant. The wheelchair 20 including the propulsion unit 54 can be completely controlled by the user since each power driven wheel 62 of the propulsion unit 54 is motorized by its own motor 62.

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To unfasten the propulsion unit 54, the coupling cable 150 is pulled to disengage the spring-loaded pins 148 from the pin holes 168 and the propulsion unit 54 is removed from under the wheelchair frame 26.

One skilled in the art will appreciate that the anchoring system used for securing
5 the propulsion unit 54 to the wheelchair 20 can differ from the one described above. The anchoring system is preferably adaptable in height and in width to adjust the propulsion unit 54 to wheelchairs 20 having different sizes and frame designs.

The design of the wheelchair frame 26 and the propulsion unit structural frame
10 56 can also differ from the one described in the previous embodiment. The mechanism used to modify the width and the height of the structural frame 56 can differ from the one described and can be any mechanism that one skilled in the art will appreciate. For example, some wheelchair frames 26 do not have vertical middle tubes 46. In this case, if the second parts 151 of the anchoring
15 system are adapted to be mounted to these vertical middle tubes 46, additional vertical tubes (not shown) can be mounted to the lower and upper longitudinal tubes 40, 42 before mounting the second parts 151 of the anchoring system to the wheelchair frame 26. The second parts 151 of the anchoring system can also be adapted to be mounted to the lower or the upper longitudinal tubes 40,
20 42 or the front or the vertical front or rear tube 44, 48.

The handle 89 can be conceived to be pivotally and/or removably mounted to the structural frame 56. For carrying the propulsion unit 54, the handle 84 can be folded over the batteries 68 or removed therefrom.

The propulsion unit 54 can also include a battery charger (not shown) disposed
25 at a suitable location on the propulsion unit 54 to recharge the batteries 68 at any moment.

Even when the propulsion unit 54 is fastened to the wheelchair 20, the user can propel manually his/her wheelchair, the propulsion unit 54 not adding important weight thereto or modifying the wheelchair behavior.

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The propulsion unit 54 is adapted for use with any type of wheelchairs such as portable 'fold and go' wheelchairs. The propulsion unit 54 can also be mounted to a wheelchair 20 that cannot be collapsed to facilitate the transportation.

5 The propulsion unit 54 is preferably adapted to allow the control of the wheelchair 20 including the propulsion unit 54 either to the user or the attendant. The wheelchair 20 including the propulsion unit 54 remains easy to maneuver and maintains a maximum adherence of the power driven wheels 62 on the ground, even over rough ground.

10 Once the propulsion unit 54 is mounted to the wheelchair 20, the propulsion unit 54 does not hamper the user's accessibility to the seat. Moreover, the propulsion unit 54 can preferably be partially dismantled for handling.

15 Rather than operatively connecting one motor 64 to each power driven wheel 62, the propulsion unit 54 can include only one motor 64 with a gearing system (not shown), or any other system known to one skilled in the art, allowing one power driven wheel 62 to rotate at a different speed than the other power driven wheel 62.

20 The shock absorber assembly can also differ from the embodiment described hereinabove. For example, the embodiment of the structural frame 56 shown on FIG. 2 slightly differs from the one shown on FIG. 3 but provides the same functionalities to the propulsion unit 54. On FIG. 2, the shock absorber assembly 196 includes a tubular member 179 extending downwardly from the lower member 78d, midway thereof, a double leg 185 extending from the opposite end of the tubular member 179, a shock absorber (not shown), and a tubular connector (not shown) extending rearwardly from the tubular member
25 179. The front caster wheel 72 is rotatably mounted to the double leg 185. As for the shock absorber assembly 96, the shock absorber assembly 196 is designed to absorb the transversal and vertical disturbances of the ground on which the wheelchair 20 is carried. FIG. 5 shows the wheelchair 20 including the propulsion unit 54 on an uneven ground and wherein the shock absorber
30 assembly 96, 196, or the suspension, absorbs the disturbances. The shock

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absorber assemblies 96, 196 improve the comfort of the wheelchair 20 for the user when the wheelchair 20 is displaced on uneven grounds.

The embodiments of the invention described above are intended to be exemplary only. For example, the batteries 68 can be mounted to the structural
5 frame 56 under the motors 64 or the caster wheel 72 can be mounted rearwardly to the structural frame 56. The scope of the invention is therefore intended to be limited solely by the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A propulsion unit adapted to be removably mounted to a wheelchair having a frame and wheels rotatably mounted thereto, the propulsion unit comprising:
 - a propulsion unit frame adapted to be removably secured to the wheelchair, said propulsion unit frame having at least a first and a second power driven wheels rotatably mounted to the propulsion unit frame, said power driven wheels being mounted between the wheelchair wheels;
 - at least one motor operatively connected to said at least two power driven wheels to distinctly provide energy thereto, said first and second power driven wheels having a respective first and second rotation speeds;
 - at least one portable energy source coupled to the at least one motor; and
 - at least one controller operatively connected to the at least one motor for controlling the first and second rotation speeds of said first and second power driven wheels,
- an anchoring system comprising: a first anchoring plate and a second anchoring plate adapted to matingly engage one another, said anchoring plates adapted for removably mounting said propulsion unit frame to said wheelchair, at least one of said anchoring plates being mounted to said wheelchair whereas other plate is mounted to said propulsion unit,
 - wherein said first anchoring plate comprises an outer surface, a lock hole with a spring-loaded pin inserted therein adapted to slidably protrude from said outer surface, and a U-shaped extension defining a localization groove with an upper arm and a lower arm extending from a lower edge of said first anchoring plate, whereby junction of said lower edge and lower arm defines a concave angle,
 - wherein said second anchoring plate comprises a first and a second fixation pivots and a pin hole,

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whereby said first anchoring plate is slid until the upper fixation pivot is fully engaged at bottom of said localization groove to cause the lower fixation pivot to slide toward and abut against said concave angle, said spring-loaded pin sliding inside said pin hole thereby anchoring said propulsion unit to said wheelchair.

2. A propulsion unit as claimed in claim 1, comprising two motors, each of said motor being operatively coupled with one of said power driven wheels.
3. A propulsion unit as claimed in claim 2, wherein at least one of said first and second plates of said anchoring system is adjustable in at least one of height and width of said wheelchair to ensure a meshing engagement of said first and second plates of said anchoring system when mounting said propulsion unit to said wheelchair.
4. A propulsion unit as claimed in one of claims 2 and 3, comprising a control lever operatively coupled with said anchoring system for unsecuring said propulsion unit from said wheelchair.
5. A propulsion unit as claimed in any one of claims 1 to 4, comprising a joystick device operatively connected to said controller, said joystick device being adapted to control the first and second rotation speeds of said power driven wheels.
6. A propulsion unit as claimed in any one of claims 1 to 5, comprising at least one stabilizing member mounted to said propulsion unit frame stabilizing said propulsion unit when unsecured to said wheelchair.
7. A propulsion unit as claimed in any one of claims 1 to 6, comprising a suspension allowing said power driven wheels to keep contact with the ground when said propulsion unit is mounted to said wheelchair.
8. A propulsion unit as claimed in any one of claims 1 to 7, wherein said wheelchair comprises a seat and said propulsion unit is inserted under said seat when mounted to said wheelchair.

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9. A kit for motorizing a wheelchair having a frame and wheels mounted thereto, comprising:

a power drive assembly having a frame with two power driven wheels adapted to be rotatably mounted thereto, each of said power driven wheels adapted to be operatively connected to at least one motor, said motors adapted to be coupled to at least one energy source and to at least one controller controlling the rotation of said power driven wheels; and

an anchoring system comprising: a first anchoring plate and a second anchoring plate adapted to matingly engage one another, said anchoring plates adapted for removably mounting said propulsion unit frame to said wheelchair, at least one of said anchoring plates being mounted to said wheelchair whereas other plate is mounted to said propulsion unit,

wherein said first anchoring plate comprises an outer surface, a lock hole with a spring-loaded pin inserted therein adapted to slidably protrude from said outer surface, and a U-shaped extension defining a localization groove with an upper arm and a lower arm extending from a lower edge of said first anchoring plate, whereby junction of said lower edge and lower arm defines a concave angle,

wherein said second anchoring plate comprises a first and a second fixation pivots and a pin hole,

whereby said first anchoring plate is slid until the upper fixation pivot is fully engaged at bottom of said localization groove to cause the lower fixation pivot to slide toward and abut against said concave angle, said spring-loaded pin sliding inside said pin hole thereby anchoring said propulsion unit to said wheelchair.

10. A kit as claimed in claim 9, wherein at least one of said first and second plate of said anchoring system is adjustable in at least one of height and width of said wheelchair to ensure a meshing engagement of said first and second plates of said anchoring system when mounting said propulsion unit to said wheelchair.

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11. A kit as claimed in one of claims 9 and 10, comprising a control lever operatively coupled with said anchoring system for unsecuring said power drive assembly from said wheelchair.
12. A kit as claimed in any one of claims 9 to 11, comprising a joystick device operatively connected to said controller, said joystick device being adapted to control the rotation speed of said power driven wheels.
13. A kit as claimed in any one of claims 9 to 12, wherein said power drive assembly comprises at least one stabilizing member mounted to said power drive assembly frame stabilizing said power drive assembly when unsecured to said wheelchair.
14. A kit as claimed in any one of claims 9 to 13, wherein said power drive assembly comprises a suspension allowing said power driven wheels to keep contact with the ground when said power drive assembly is mounted to said wheelchair.
15. A kit for providing a wheelchair adaptable in one of: a hand powered mode and a motorized mode, comprising
 - a wheelchair frame with two wheels rotatably mounted thereto;
 - a propulsion unit frame having at least one motor mounted thereto, a right and a left power driven wheels operably and distinctly coupled to the at least one motor, said right and left power driven wheels being characterized by a respective first and second rotation speeds, said at least one motor being coupled with at least one battery and a controller for controlling said first and second rotation speeds; and
 - a mounting structure having at least one first mounting plate carried by said propulsion unit frame and at least one second mounting plate carried by said wheelchair,

wherein said first anchoring plate comprises an outer surface, a lock hole with a spring-loaded pin inserted therein adapted to slidably protrude from said outer surface, and a U-shaped extension defining a localization

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groove with an upper arm and a lower arm extending from a lower edge of said first anchoring plate, whereby junction of said lower edge and lower arm defines a concave angle,

wherein said second anchoring plate comprises a first and a second fixation pivots and a pin hole,

whereby said first anchoring plate is slid until the upper fixation pivot is fully engaged at bottom of said localization groove to cause the lower fixation pivot to slide toward and abut against said concave angle, said spring-loaded pin sliding inside said pin hole thereby anchoring said propulsion unit to said wheelchair.

16. A kit as claimed in claim 15, said propulsion unit comprises two motors, each of said motor being operatively coupled with one of said power driven wheels.
17. A kit as claimed in one of claims 15 and 16, wherein at least one of said at least one first and second mounting plates of said mounting structure is adjustable in at least one of height and in width of said wheelchair to ensure a meshing engagement of said at least one first and second mounting plates of said mounting structure when mounting said propulsion unit to said wheelchair.
18. A kit as claimed in any one of claims 15 to 17, comprising a control lever operatively coupled with said mounting structure for unsecuring said propulsion unit from said wheelchair.
19. A kit as claimed in any one of claims 15 to 18, comprising a joystick device operatively connected to said controller, said joystick device being adapted to control the first and second rotation speeds of said power driven wheels.
20. A kit as claimed in any one of claims 15 to 19, said propulsion unit comprises at least one stabilizing member mounted to said propulsion unit frame stabilizing said propulsion unit when unsecured to said wheelchair.

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21. A kit as claimed in any one of claims 15 to 20, said propulsion unit comprises a suspension allowing said power driven wheels to keep contact with the ground when said propulsion unit is mounted to said wheelchair.
22. A kit as claimed in any one of claims 15 to 21, wherein said wheelchair comprises a seat and said propulsion unit is inserted under said seat when mounted to said wheelchair.

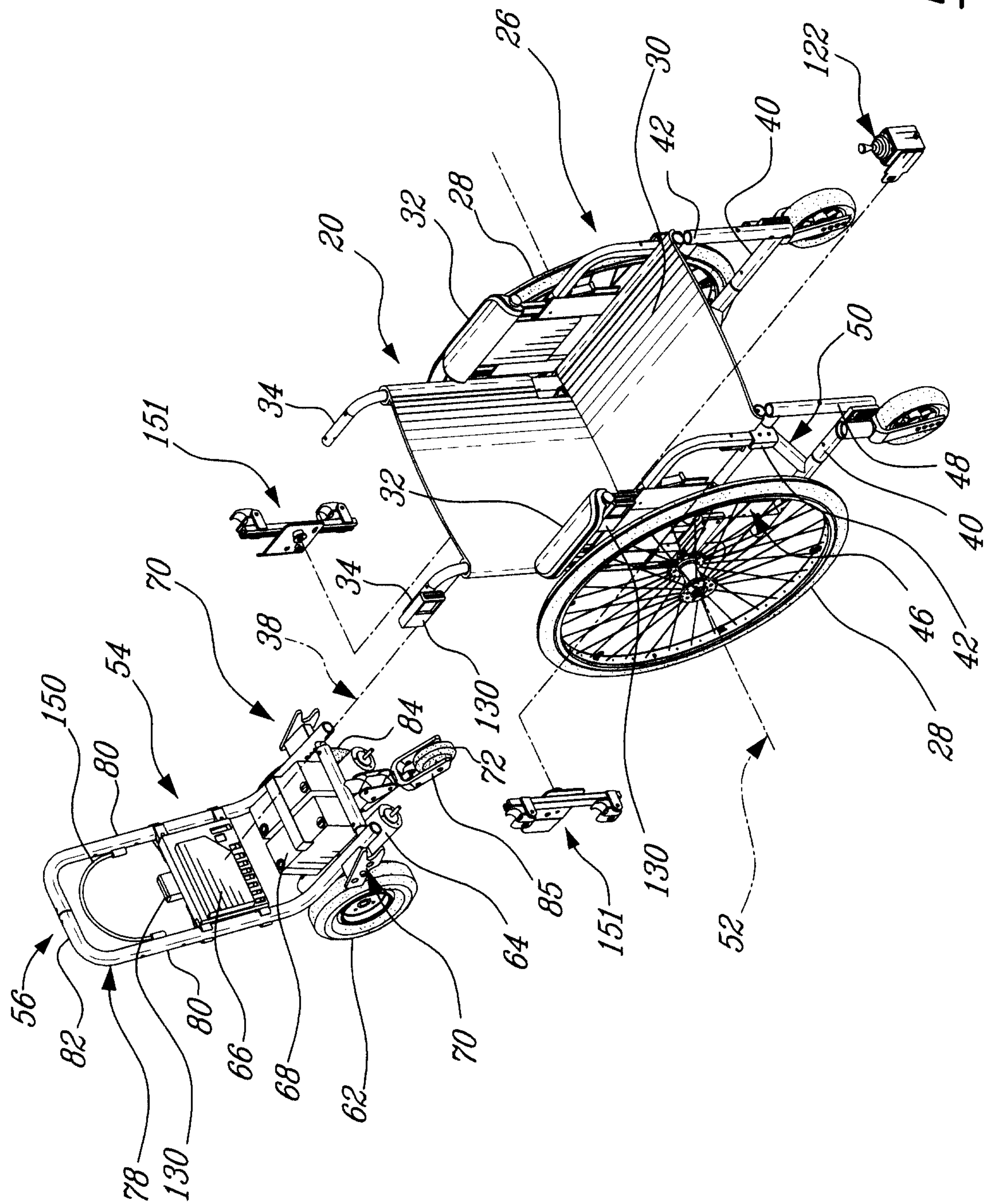
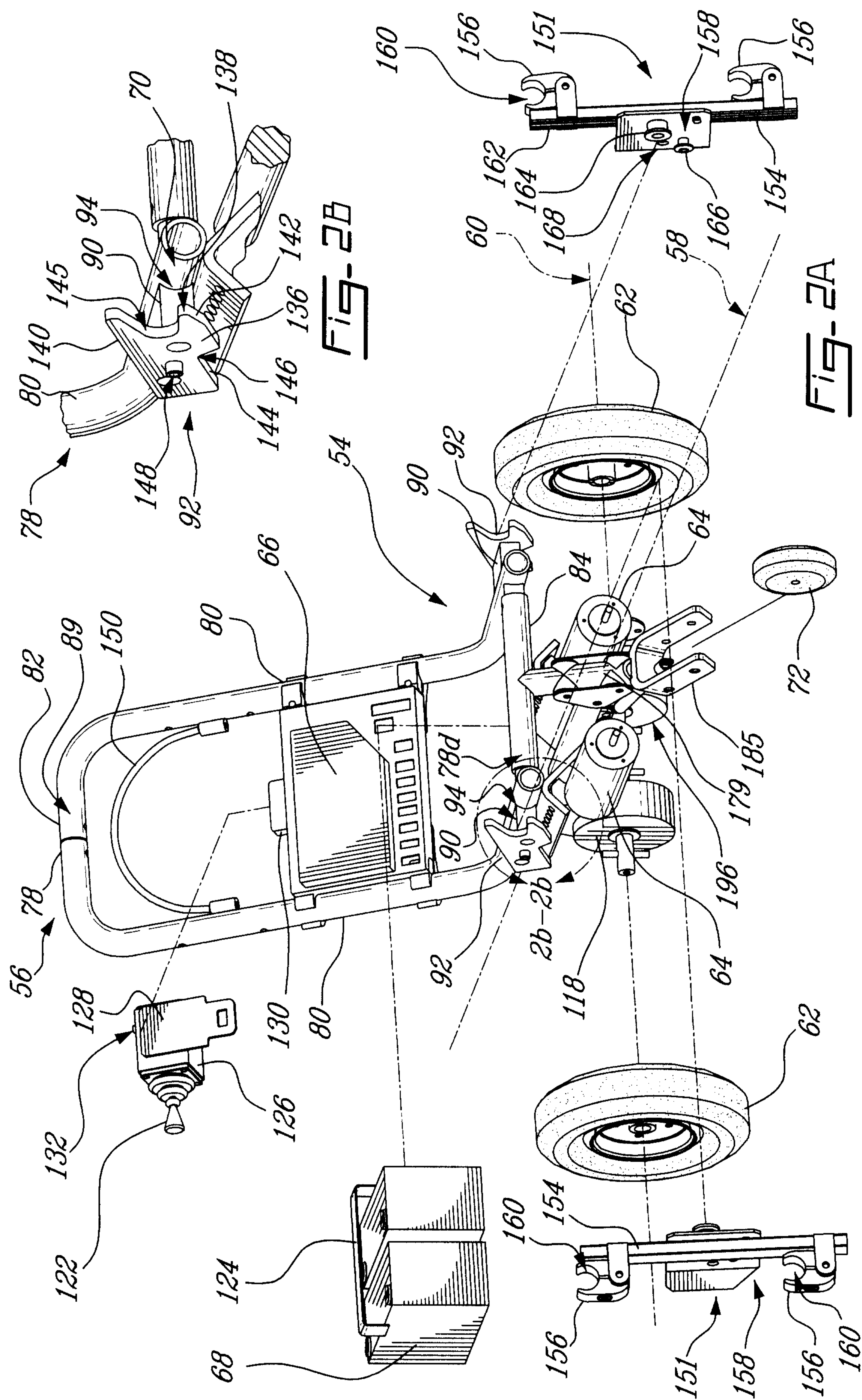


Fig-1



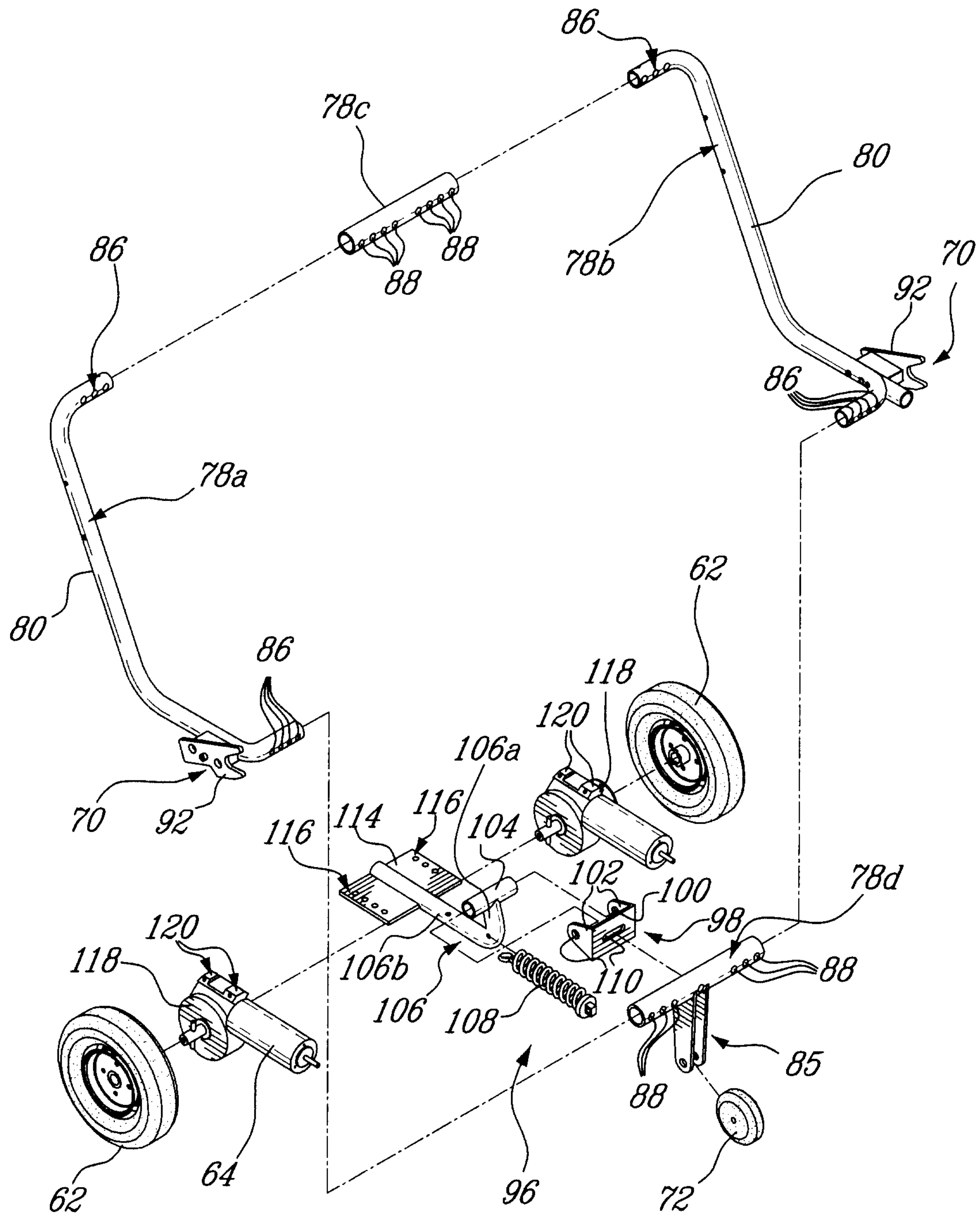


Fig-3

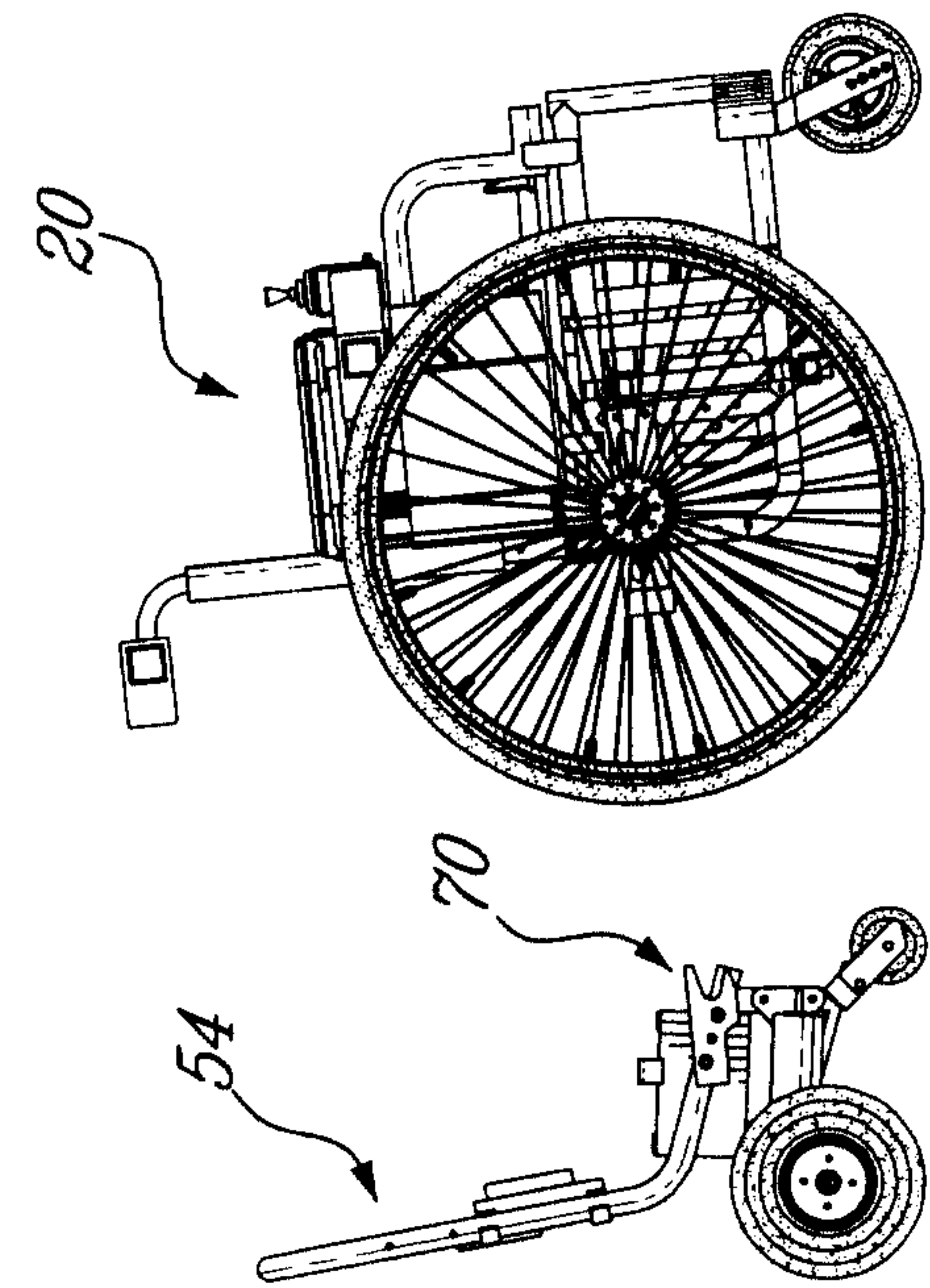


Fig-4A

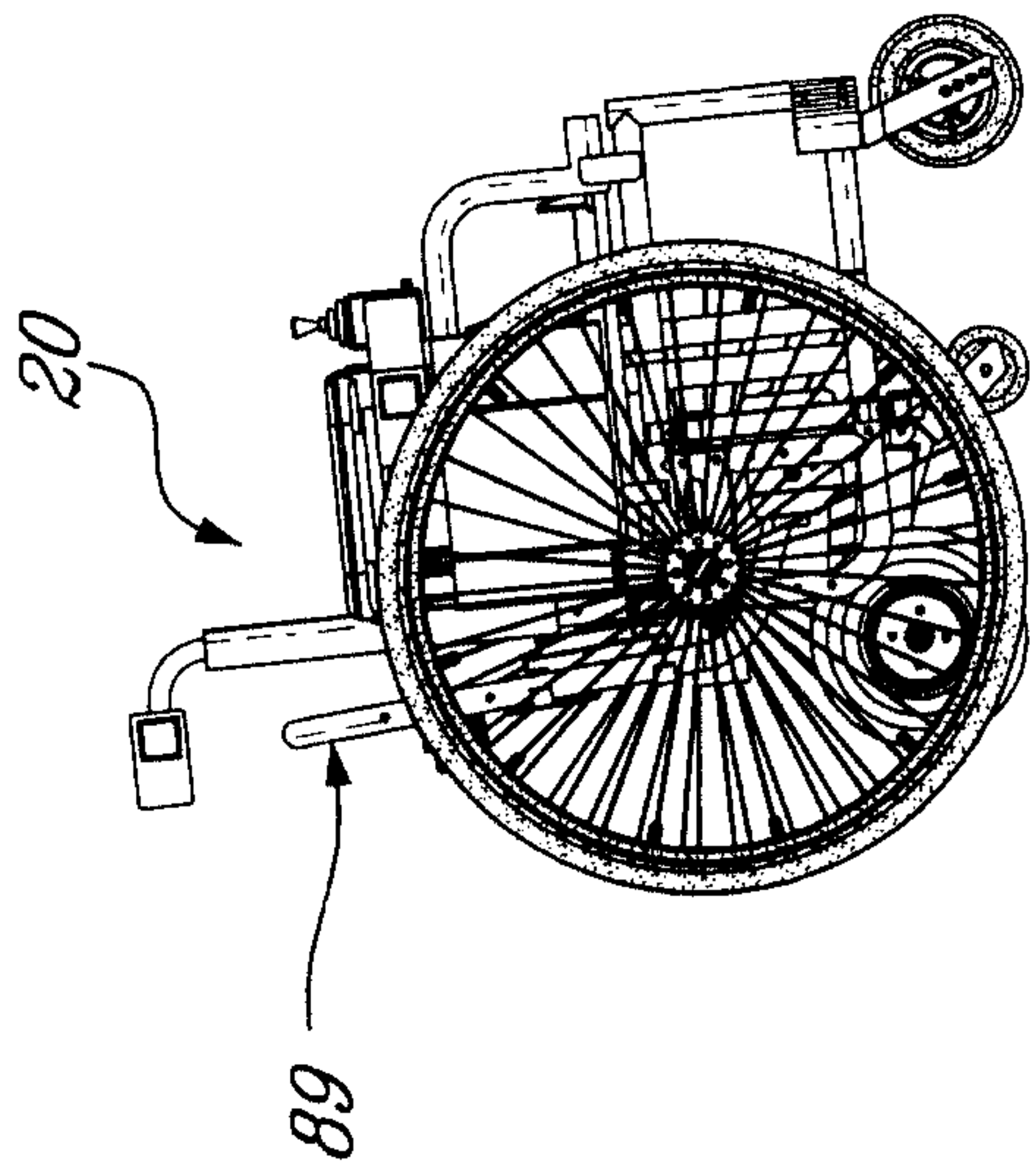


Fig-4B

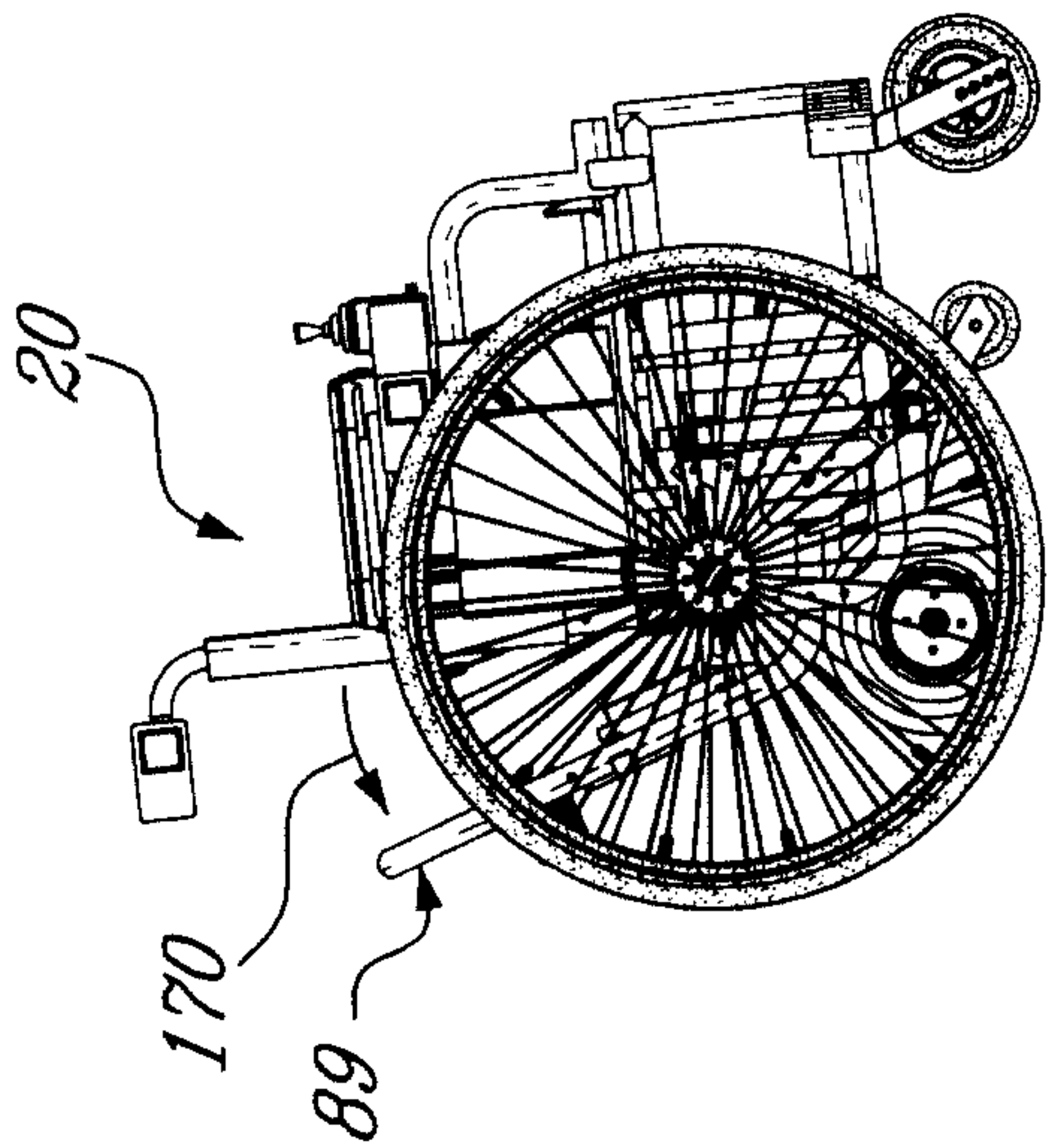


Fig-4C

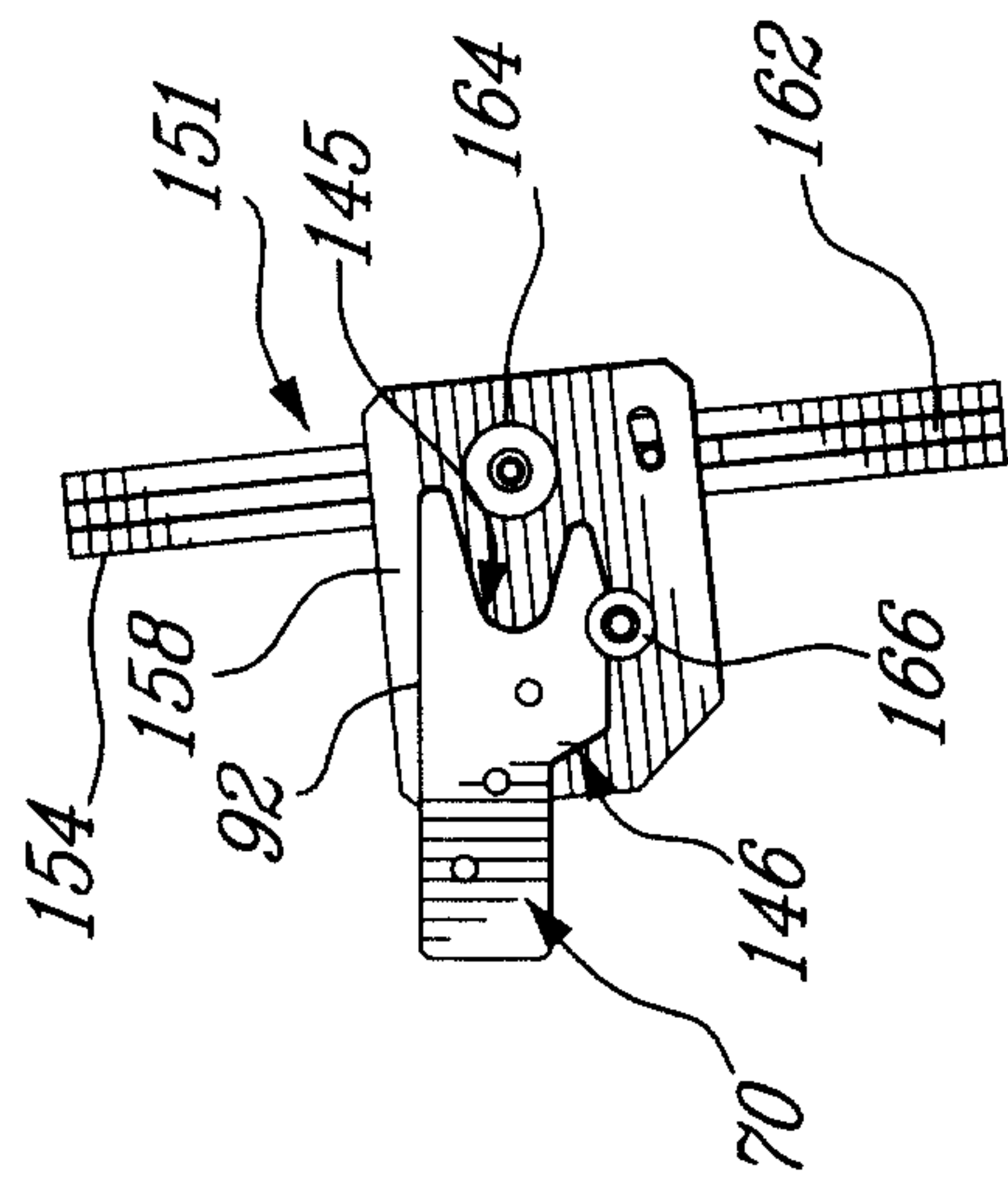


Fig-4D

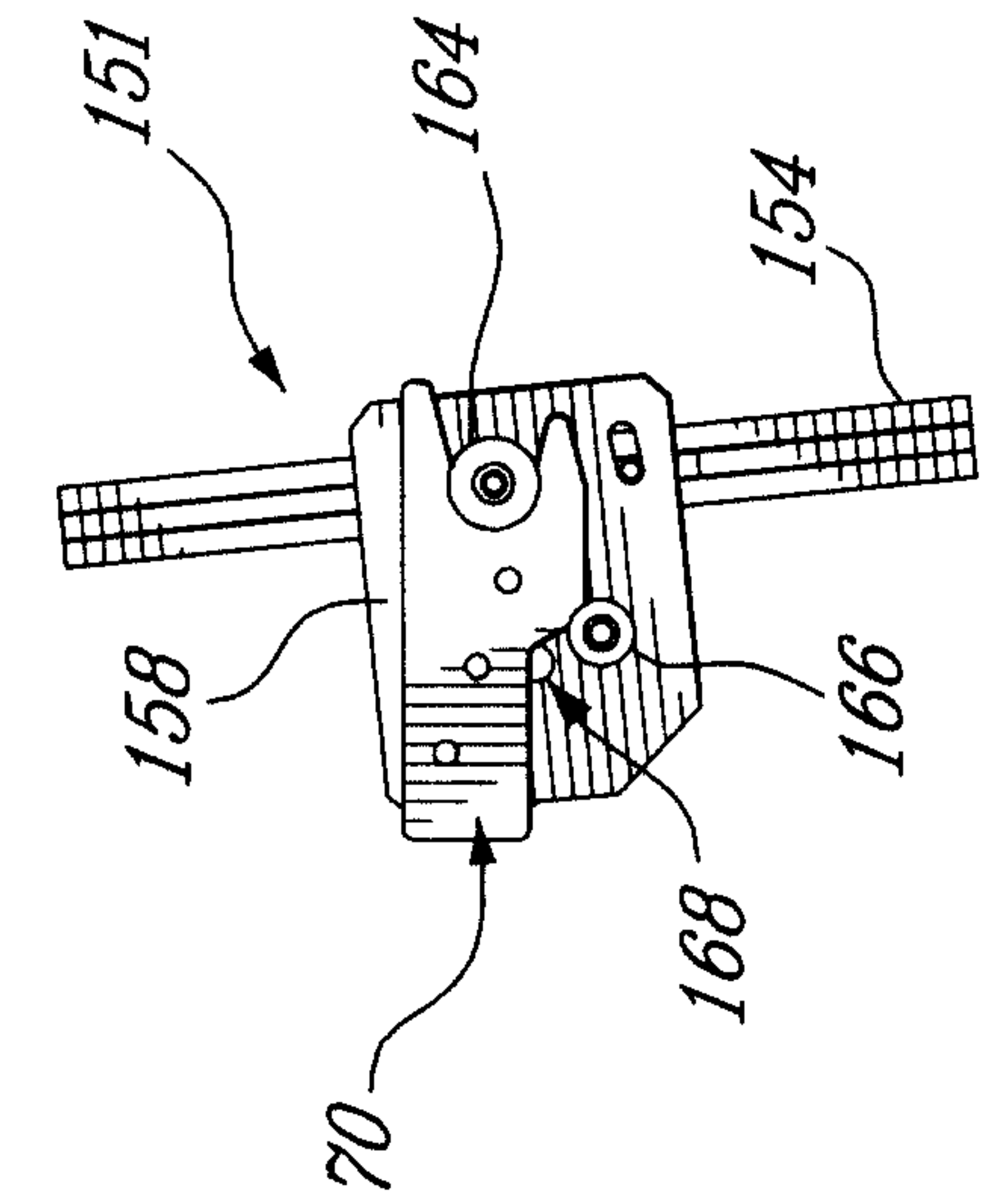


Fig-4E

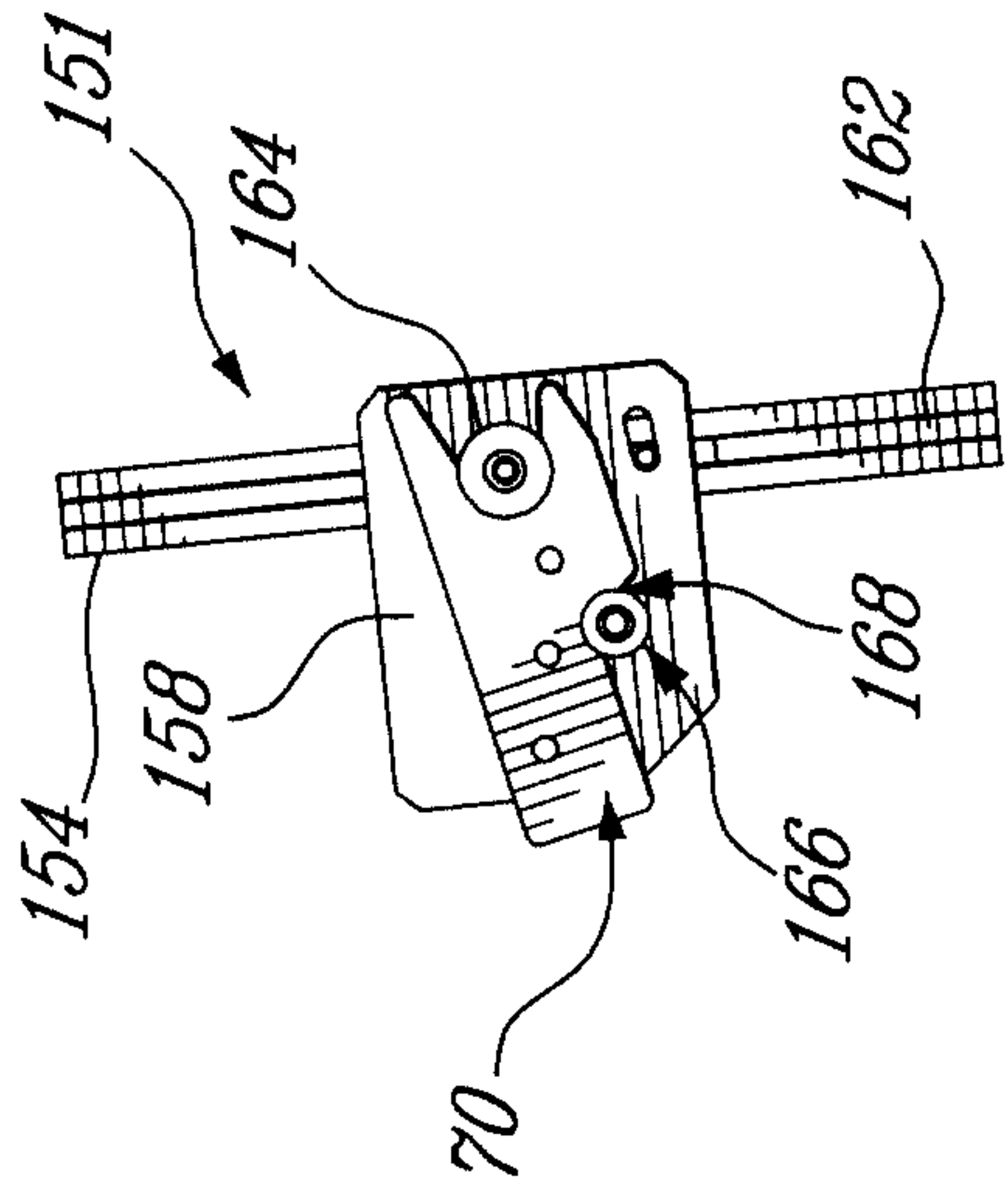


Fig-4F

