(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 369 791 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89311886.9**

(51) Int. Cl.5: **A61G 5/04**

(22) Date of filing: **16.11.89**

(30) Priority: **16.11.88 GB 8826768**

(43) Date of publication of application:
23.05.90 Bulletin 90/21

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: **SUNRISE MEDICAL LIMITED**
Fens Pool Avenue
Brierley Hill West Midlands DY5 1QA(GB)

(72) Inventor: **Gould, Royston Mervyn**
6 Muirfield Crescent, Oakham Green
Tividale, Warley, West Midlands(GB)

(74) Representative: **Lewis, Samuel Hewitt et al**
FORRESTER & BOEHMERT
Widenmayerstrasse 4/I
D-8000 München 22(DE)

(54) Vehicle.

(57) A wheelchair comprises right and left wheel units (12,13) which are demountable from a frame (10) of the chair. Each wheel unit (12, 13) incorporates one running wheel (22) and a motor (24) for driving that wheel (22).

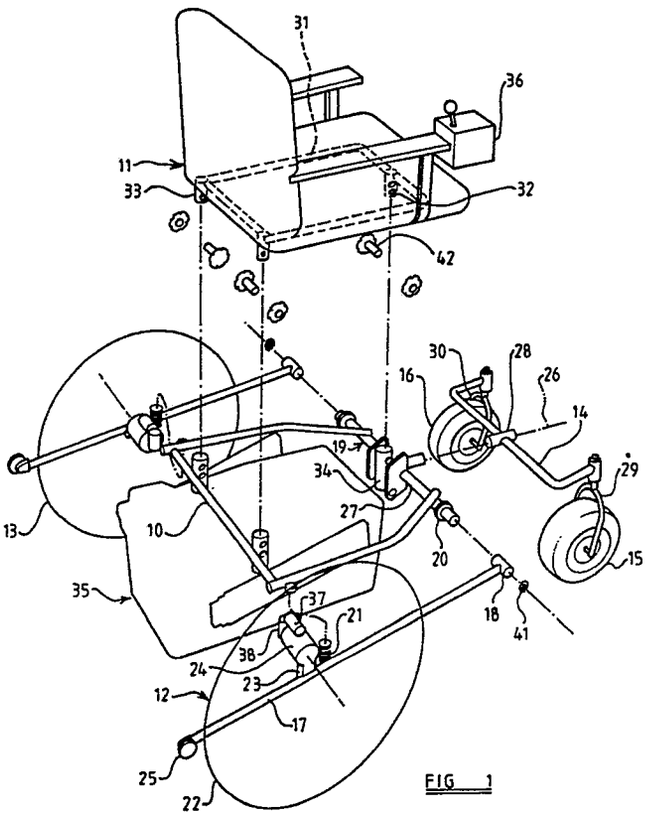


FIG 1

EP 0 369 791 A1

"Vehicle"

The present invention relates to a vehicle and has been devised primarily for wheelchairs and other vehicles suitable for use by handicapped persons.

Wheelchairs which can be dismantled and/or folded to a sufficiently compact configuration to be placed in a confined space, for example the boot of a car, are known. However, these wheelchairs are not motorised and must be propelled by the occupant and/or by an accompanying pedestrian. There are also known vehicles which are suitable for use by disabled or handicapped persons and which have electric motors for driving the vehicles but these vehicles cannot be readily dismantled or folded for storage or transport in a confined space. One object of the present invention is the provision of a vehicle which is more easily stored and transported in a confined space than are known motorised vehicles.

According to a first aspect of the present invention, there is provided a vehicle comprising a frame, a seat on the frame and a pair of wheel units releasably mounted on the frame at opposite sides thereof, wherein each wheel unit includes a ground-engaging wheel, a carrier having formations which co-operate with the frame to support the frame on the carrier and an electric motor for driving the wheel about its axis relative to the carrier, the motor being on the carrier.

The frame is preferably adjustable to vary the separation between the wheel units.

The seat preferably has a number of legs which are received by complementary formations on the frame. The legs may be adjustable upwardly and downwardly relative to the frame and may be releasable from the formations of the frame to enable the seat to be removed and replaced by a different seat, for example a seat having a different width corresponding to an alternative width of the frame.

Each wheel unit is preferably connected with the frame by means of a pivot and biasing means spaced from the pivot and urging the frame upwards relative to the wheel unit. The pivot is preferably further from the axis of the wheel than is the biasing means. The pivot axis may be spaced from the wheel axis by a distance greater than twice the spacing of the biasing means from the wheel axis. With this arrangement, the pivot is relatively lightly loaded. The major part of the gravitational load is transmitted from the frame to the wheel unit via the biasing means. The pivot can readily be constructed and arranged for dissassembly without the use of tools and can readily be so constructed and arranged that unskilled persons can reliably establish the proper pivotal connection between the wheel unit and frame.

In the preferred vehicle, there is provided on the frame a battery carrier for carrying batteries for supplying power to the motors of the wheel units. The battery carrier may lie between the wheel units and is preferably connected with the frame by a pair of slides which enable the battery carrier to slide, by extension of the slides, from its position between the wheel units to a second position in which the battery carrier can readily be demounted from the slides.

There is also provided according to a the invention, a vehicle comprising a plurality of running wheels, a first electric motor for driving the vehicle, control means for controlling operation of the motor, a battery for suppling electrical power to the motor and a second electrical motor of a capacity insufficient to drive the vehicle, wherein the second electrical motor has a rotor coupled mechanically with a rotor of the first motor and wherein a winding of the second motor is electrically connected with the control means to provide to the control means an electrical signal representing turning of the rotors.

The second motor is conveniently mounted on the outside of the first motor and a belt and pulley drive mechanism may be provided for coupling respective rotory elements of the motors.

An example of a vehicle embodying the invention will now be described, with reference to the accompanying drawings, wherein:-

FIGURE 1 shows a diagrammatic representation of the vehicle with component separated from each other;

FIGURE 2 shows diagrammatically a battery carrier and associated parts of the vehicle; and

FIGURE 3 shows a block diagram of an electrical circuit of the vehicle.

The vehicle illustrated in the accompanying drawings comprises a frame 10, which carries a single seat 11. At each of two opposite sides of the frame, there are respective wheel units 12 and 13 and at a front of the frame there is a front carrier 14 supported on front wheels 15 and 16 of the vehicle which are spaced apart laterally.

The wheel unit 12 includes an elongated carrier 17 which is releasably mounted adjacent to one of its ends on the frame 10. At this end, the carrier includes a bush 18 which is a sliding fit on an end portion of a horizontal tube 19 of the frame. Immediately adjacent to its free-end, this end portion of the tube has a diammetral hole for receiving retaining means for retaining the bush 18 on the tube. Travel of the bush away from the retaining means

is limited by a collar 20 on the tube. The retaining means may comprise a resilient clip 41 having a circular or part-circular portion for embracing the end portion of the tube and a rectilinear limb for extending into or through the hole in the tube. The retaining means can readily be removed from the tube to permit the bush 18 to slide off the end of the tube 19.

The carrier 17 is further connected with the frame 10 through the intermediary of a coiled compression spring 21. One end portion of the spring is mounted on the carrier at a position between the ends of the latter. The spring extends upwardly from the carrier to a spring seat on the frame 10. The spring is releasably connected with the spring seat, for example by a screw and nut.

The wheel unit 12 further comprises a ground-engaging wheel 22. A bearing hub 23 for connecting the wheel with the carrier 17 for rotation relative thereto about an axis of the wheel is secured on the carrier at a position between the ends of the carrier and spaced somewhat further from the bush than is the spring 21. There is secured on the hub 23 an electric motor 24 for driving the wheel through a gear box integral with the motor. The motor also includes an electro-magnetically released brake (not shown separately) which is applied by a spring and which is released when energised by electric current. Provision may also be made for setting the brake in an on-condition mechanically, by operation by a handle, in a known manner.

At the end of the carrier 17 remote from the bush 18, there may be provided a roller 25 which protrudes rearwardly beyond the running wheel 22 to prevent the vehicle being overturned by tippiong rearwardly about the point of contact between the wheel 22 and the ground. The roller 25 may be mounted on a stem which is arranged telescopically in the carrier 17.

The wheel unit 13 includes components corresponding to each of the components of the wheel unit 12. The carriers of the wheel units can pivot independently of one another about the axis of the tube 19 to accommodate the vehicle to uneven ground. Furthermore, each of the wheel units can be demounted from the frame 10 independently of the other wheel unit. It will be noted that only two fastenings must be released to free each wheel unit from the frame.

The distance between the spring 21 and the axis of the wheel 22 is less than the radius of that wheel. The pivot axis defined by the bush 18 is spaced from the axis of the wheel 22 by a distance exceeding the radius of that wheel. Preferably, the spacing of the pivot axis from the wheel axis is more than twice the spacing of the spring 21 from the wheel axis.

The front carrier 14 is connected with the frame 10 for rocking relative thereto about a horizontal axis 26 which extends longitudinally of the vehicle, mid-way between the wheel units 12 and 13. On a mid-portion 27 of the horizontal tube 19, there is provided a forwardly projecting spigot which receives a bush 28 secured on the front carrier 14. The bush is releasably retained on the spigot, for example by a screw and nut. The front carrier 14 is elongated and is arranged with its length extending laterally of the vehicle. Adjacent to each of its ends, the carrier is connected with the front wheels 15 and 16 by pivoted forks 29,30 which provide for castoring of the wheels 15 and 16 relative to the front carrier.

It will be understood that, whilst we prefer to provide on the front carrier a pair of wheels which are spaced apart by a distance similar to the spacing between the wheels of the wheel units 12 and 13, the front wheels could be closer together or a single front wheel could be provided.

The seat 11 comprises a generally rectangular frame having three legs, one of which is identified by the reference numeral 32 and one other of which is identified by the reference numeral 33. The leg 32 is disposed near to the front of the seat and on a longitudinal centreline of the seat. The other legs are disposed near to opposite rear corners of the seat.

The mid-portion 27 of the horizontal tube 19 carries a pair of rearwardly projecting lugs between which there is pivotally suspended a tube 34. The tube can rock so that its longitudinal axis moves in a vertical plane containing the longitudinal centreline of the vehicle. The front leg 32 of the seat is received in the tube 34 and can slide along the tube. A nut and bolt or other releasable fastener 42 is provided for setting the leg 32 in a selected position along the tube 34 to determine the height of a front portion of the seat.

The rear legs of the seat are received telescopically in corresponding tubes provided on the frame 10 and releasable fasteners are provided for securing these legs in their tubes at selected positions. By adjustment of the rear legs along their tubes, the height of a rear portion of the seat can be adjusted independantly of adjustment of the front portion of the seat. By withdrawing each of the legs from its corresponding tube, the seat can be removed from the frame 10 and replaced by a different seat.

The transverse members of the frame 10 may all be telescopically adjustable so that the overall width of the frame can be adjusted. It will be understood that the seat must be removed prior to such adjustment and then replaced by a different seat, having a different width, in order that the legs of the seat will register with the corresponding

tubes on the frame.

The seat may include a cushion, back-rest and arm rests all carried on the seat frame in a known manner and these components of the seat may be detatchable from the seat frame 31.

Electrical power for the motors of the wheel units 12 and 13 is supplied from a battery of electrical cells disposed in a battery carrier 35. The battery carrier is mounted on the frame 10 and is disposed between the wheel units 12 and 13. Preferably, the battery carrier is connected with the frame 10 by means of a pair of telescopic slides 46 which provide for movement of the battery carrier from the normal position, in which the battery carrier lies substantially entirely between the wheels of the wheel units 12 and 13, to a position in which the battery carrier lies at least mainly rearwards of the wheel units and is therefore readily accessible.

In the example illustrated, the battery carrier has two pins 43,44 projecting horizontally from each of its sides. These pins engage respective slots in a plate 45 secured to one element of the corresponding telescopic slide 46. When the slides have been extended, the pins can readily be withdrawn from their slots by movement of the battery carrier relative to the remainder of the vehicle, so dismounting the battery carrier from the slides. The battery carrier may be provided with rolling elements 47 at its forward end to roll on a floor as the battery carrier is drawn away from the vehicle or rolled upto the vehicle.

Control means 36 is provided for controlling energisaton of the motors of the wheel units 12 and 13. The control means is mounted adjacent to one arm rest or in any other convenient position for operation by the occupant of the vehicle. Alternatively, the control means could be mounted in a position convenient for operation by an accompanying pedestrian. The control means is settable in a condition in which the driving motors of both wheel units 12 and 13 are driven at the same speed and is alternatively settable in a condition in which one of these motors is driven at a speed different from that at which the other motor is driven, thereby causing the wheelchair to turn. The control means may be of known form and may, for example, include a joystick.

Signalling means is provided for providing to the control means 36 an electrical signal representing turning of the wheel 22. This signalling means comprises a relatively small electric motor 37 which is mounted by means of suitable bracket on the outside of the driving motor 24. A winding of the motor 37 is connected by suitable leads with the control means. Respective rotors of the drive motor 24 and signalling motor 27 are connected mechanically by a belt and pulley drive system 38 which has a velocity ratio of unity.

The electrical circuit containing the drive motor 24 and the signalling motor 37 is illustrated diagrammatically in Figure 3. This circuit includes a comparator 29 for comparing with the signal provided by the signalling motor 37 a further signal representing the required direction and speed of the drive motor. The output from the comparator is fed to a uni-directional amplifier 40 which controls the flow of current from the battery to the drive motor 24. It will be appreciated that, whenever the motor 24 turns, the signalling motor 37 functions as a generator to provide a DC signal representing turning of the rotors of the two motors. The polarity of this signal indicates the direction of rotation and the amplitude of the signal represents the speed of rotation.

A circuit corresponding to that shown in Figure 3 is provided for controlling the driving motor of the wheel unit 13 and that unit includes signalling means corresponding to that signalling means 37.

Electrical components of the vehicle are connected with one another by suitable leads incorporating separable connectors. These connectors are undone when the wheel units 12 and 13 are disconnected from the frame 10 and the battery in the carrier 35 is dismounted from the frame. The control means 36 also may be dismounted from the frame 10, for example if the seat 11 is removed from the frame.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A vehicle comprising a frame (10), a seat (11) on the frame and a pair of wheel units (12, 13) releasably mounted on the frame at opposite sides thereof, wherein each wheel unit includes a ground-engaging wheel (22), a carrier (17) having formations which co-operate with the frame to support the frame on the carrier and an electric motor (24) for driving the wheel about its axis relative to the carrier, the motor being mounted on the carrier.

2. A vehicle according to Claim 1 wherein each wheel unit further comprises a resilient element (21) interposed between the frame (10) and the carrier (17) for transmitting a gravitational load to the carrier from the frame.

3. A vehicle according to Claim 1 wherein the carrier (17) of each wheel unit is connected with the frame (10) for swinging relative thereto.

4. A vehicle according to Claim 2 wherein the carriers (17) of the wheel units are both connected with the frame (10) for pivoting relative thereto about a common pivot axis.

5. A vehicle according to Claim 4 wherein the pivot axis is substantially parallel to axes of said wheels.

6. A vehicle according to Claim 5 wherein the pivot axis is spaced from the axis of the wheel (22) of each wheel unit by a distance which is substantially greater than the radius of the wheel.

7. A vehicle according to Claim 5 wherein the distance between the resilient element (21) and the axis of the wheel (22) is less than the radius of the wheel.

8. A vehicle according to any preceding Claim comprising a further carrier (14) which is releasably connected with the frame (10) for rocking relative to the frame about a rocking axis (26) which passes between the wheels of said wheel units, said further carrier being provided with a pair of ground-engaging wheels (15, 16).

9. A vehicle according to any preceding Claim wherein the seat (11) has a plurality of legs (32, 33), the frame has respective formations for receiving said legs, the legs are adjustable upwardly and downwardly relative to said formations and wherein the attitude of the seat relative to the frame is adjustable by adjusting one or more said legs without raising or lowering another leg or some other legs.

10. A vehicle according to any preceding Claim wherein said frame (10) is adjustable to vary the separation between the wheel units (12, 13).

11. A vehicle according to any preceding Claim wherein a battery carrier (35) is provided on the frame (10) the battery carrier lies between the wheel units (12, 13), a pair of slides (46) which are interposed between the battery carrier and the frame so that the battery carrier can slide from its position between the wheel units to a second position and wherein the battery carrier is demountable from the slides when in its second position.

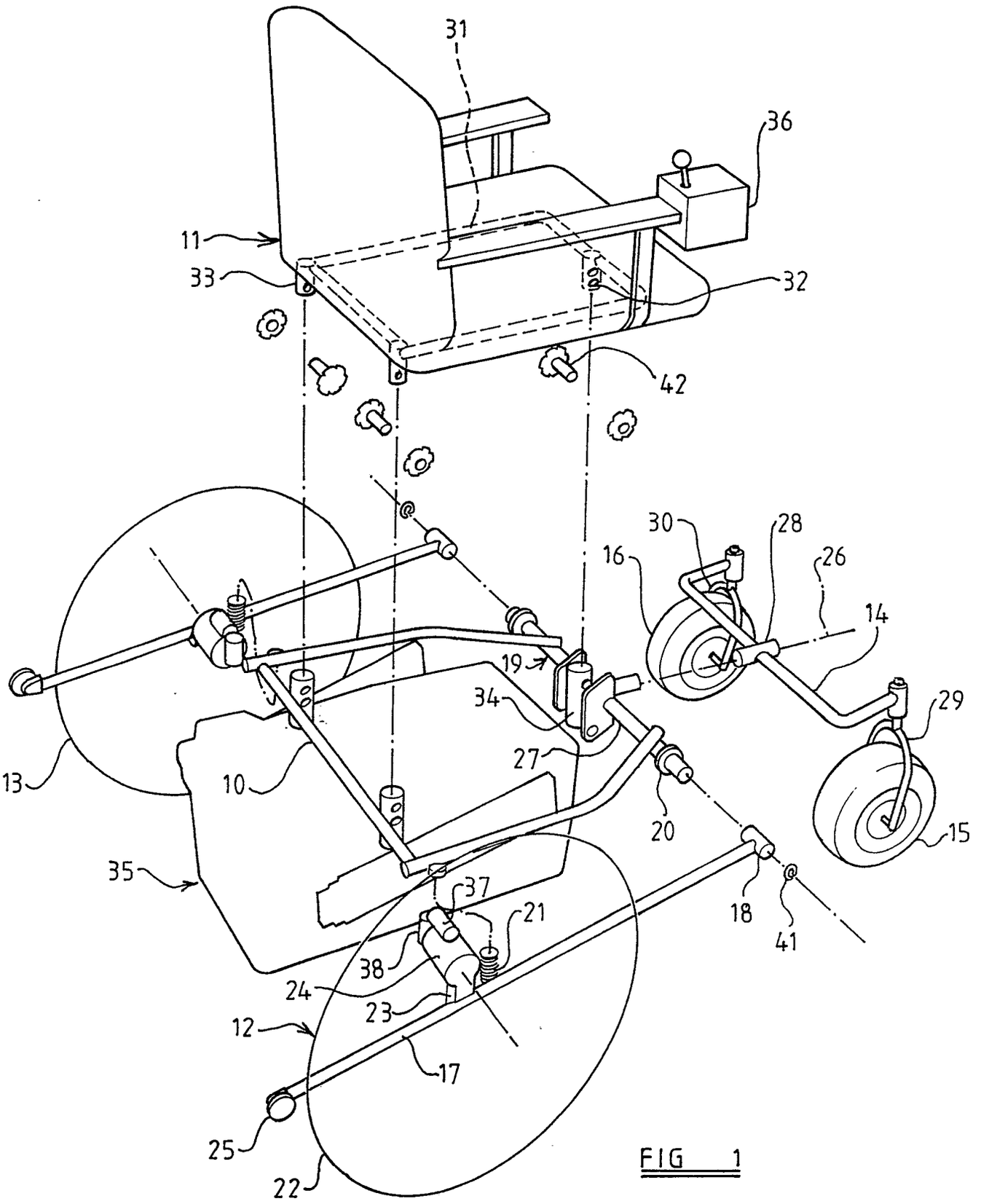

31
36
11
33
32
42
30
28
26
16
14
19
34
29
27
13
10
20
15
35
37
21
18
41
38
24
23
12
17
25
22

FIG 1

FIG 2

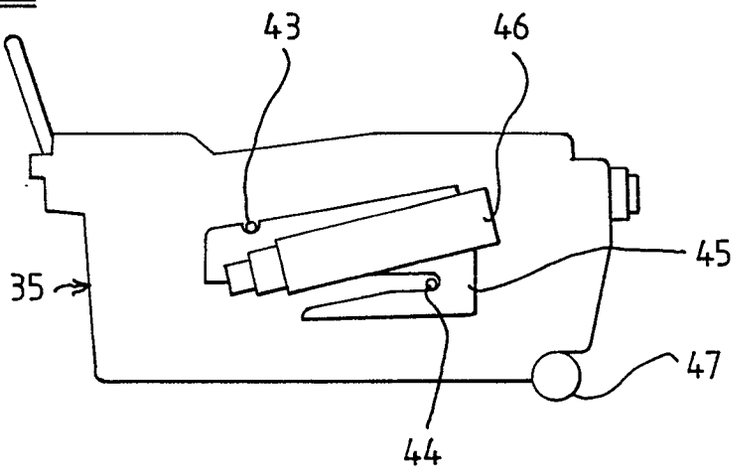
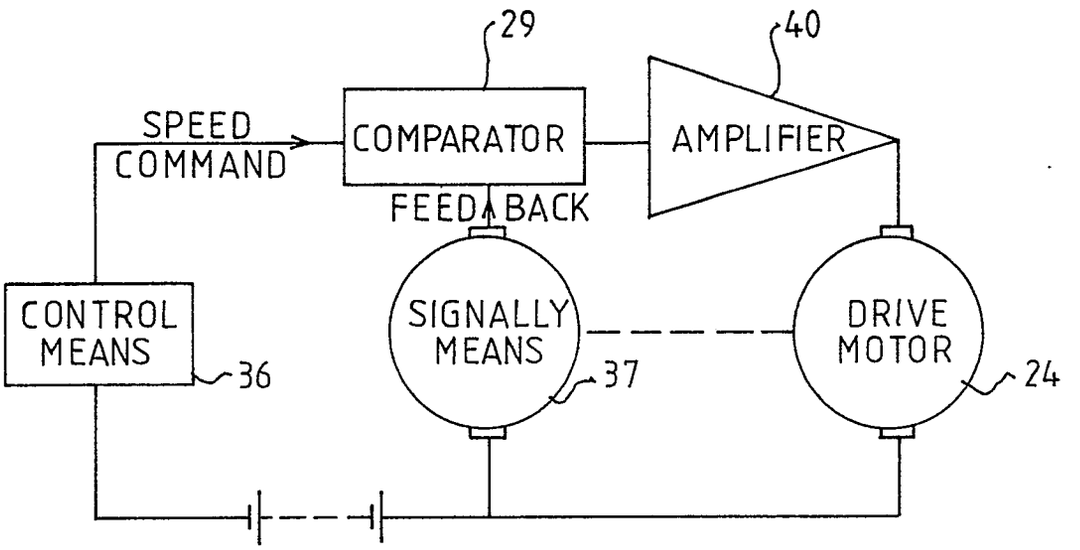

43
46
45
35
47
44

FIG 3


29
40
SPEED COMMAND
COMPARATOR
AMPLIFIER
FEEDBACK
CONTROL MEANS
36
SIGNALLY MEANS
37
DRIVE MOTOR
24

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 31 1886

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 896 891 (MILTENBURG) * Column 2, lines 18-58; figure 2 *	1	A 61 G 5/04
A	WO-A-8 102 709 (ENIX) * Claim 1; figure 4 *	1	
A	GB-A-2 061 197 (DEVELOPMENT FINANCE CORP. OF NEW ZEALAND) * Page 1, line 92 - page 2, line 34; figure 1 *	1	
A	GB-A-1 575 354 (THE SPASTICS SOCIETY) * Page 2, lines 14-44; figure 2 *	2	
A	FR-A-2 562 790 (SOC. CREATION SPORTS ET REEDUCATION) * Page 2, lines 19-34; figures 1-3 *	9,10	
A	FR-A-2 601 241 (GIRPEH-LORRAINE) * Page 4, lines 12-29; page 6, lines 2-5; figures 1,2 *	11	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 61 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19-02-1990	BAERT F.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)